

The Issue of Centralized Procurement

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The Grace Commission's study of federal deficit-reduction options, carried out in 1982-1983, culminated in a 47-volume report that has become a landmark in the literature on the subject. One of its recommendations is that the Defense Department consolidate its procurement process, a proposal that has wide-ranging implications for national security. The misinformation and misunderstanding surrounding this recommendation persist, however, and in this piece, the project manager of the commission's defense task force responds to critics of the concept. He calls for an evaluation of centralized procurement on its merits.

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Acquisition is a profession. Attracting and retaining talented practitioners, therefore, requires a flexible approach to personnel management. In recognition of this fact, the Defense Department is calling for creation of an elite corps of defense acquisition professionals. Its members will be the key to improving acquisition in DoD. What shape will such a work force take? How will it function? In this article, a senior-level policy-maker explores some possibilities and discusses what steps must be taken before the proposed corps can become reality.

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Maintenance is a critical variable in any weapon system equation. Neither readiness nor sustainability is possible without it, and at an annual cost of \$14 billion, it definitely qualifies as one of the Defense Department's big-ticket items. Well aware of their stewardship responsibilities, the managers of DoD's depot maintenance program are pursuing streamlining initiatives on a number of fronts. Interservice support, inventory management, and asset capitalization are among them, as the author explains in his survey of actions under way.

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Consolidated DoD procurement: the time is still right

By WILLIAM H. TREMAYNE

However well-intentioned, critics of centralized defense procurement have not always been well-informed. The time has come to clear the air in this vitally important area.

Editor's note: The dialogue about the merits of centralized defense procurement is an ongoing one. One notable milestone in that exchange was a report issued by the defense task force of the President's Private Sector Survey on Cost Control, better known as the Grace Commission. Of 316 proposals put forward by the commission in the areas of defense and international affairs, few garnered more attention than the recommendation that the Defense Department consolidate acquisition functions within the office of the secretary of defense. In the remarks below, the task force project manager responds to major criticisms levelled at his group's recommendation that DoD centralize its procurement process.

Perhaps the most sweeping proposal of the Grace Commission's Task Force on the Office of the Secretary of Defense was the recommendation that "consolidation of management of the acquisition process within the Office of the Secretary of Defense (OSD) would improve program efficiency and provide opportunities for significant cost savings."¹ The problems addressed by the task force were no different from those addressed by many critics of defense procurement, but we did go further than most in reaching for a cure.

As was true of other Grace Commission task forces, the

group that addressed defense issues were not experts in Defense Department matters. We were experienced business professionals with special skills in civilian procurement, personnel, organizational planning, and financial analysis. The overall charge we shared with all task forces was to find more cost-effective ways to accomplish necessary government functions.

To some, our mission smacked of knee-jerk hostility to the size of the defense budget and uninformed meddling in military matters. It is useful, therefore, to compare our observations and findings with those of the President's Blue Ribbon Commission on Defense Management, otherwise known as the Packard Commission. That group included four former senior civilian defense officials, four retired high-ranking military officers, two former Cabinet members, three businessmen, a senator, and a congressman, all of whom can fairly be described as friendly to the goals of the Department of Defense.

In the introduction to its February 1986 interim report, the Packard Commission stated:

The Armed Forces of the United States are now and for the foreseeable future an essential bulwark against the advance of tyranny. The purpose set forth two centuries ago by the drafters of the Constitution—to 'provide for the common defense'—is one that we can meet today only with Armed Forces of the utmost strength and readiness.

As *Business Week* observed in its March 10, 1986, issue, "When the commission was appointed last summer, critics charged that it would whitewash Defense. But it has not."³ Moreover, on April 2, 1986, President Ronald Reagan actually put many of the Packard Commission's recommended reforms into effect and called upon the Congress to enact those that required legislation.

Earlier, one of the key recommendations of the Grace Defense Task Force had been a reorganization of DoD to facilitate control over and coordination with the services on acquisition matters. Specifically, we recommended that Congress establish a new position, the under secretary of defense for acquisition. The Packard Commission echoed that call, and the president included the provision in the legislative package he sent to the Congress.

Meanwhile, Congress had already been working along similar lines. In March 1986, the Senate Armed Services Committee had approved a defense reorganization bill that, among other things, called for the creation of an under secretary of defense for acquisition. Like the Grace Defense Task Force proposal (but unlike that of the Packard Commission), the bill provided for separate under secretaries for research and engineering and for acquisition.

In my view, putting either the Packard Commission or Senate committee recommendation into effect would result in considerable improvement in the defense acquisition process. However, neither addresses the question of consolidation in the form proposed by the Grace Commission task force. The environment created by those two versions would constitute a middle ground between those who are advocates of no organizational change and those, like us,

coordination long antedated creation of the Department of Defense itself. Historically, the services have fiercely protected all functions for which they are responsible and have resisted attempts to consolidate functions, whether in the office of the secretary of defense, unified commands, or specified commands. These reactions are generally healthy, reflecting the high regard that each service has for its singular competence. Service competition also helps ensure that the department, the administration, and the Congress will fully weigh varying viewpoints before resolving fundamental questions.

Frequently, however, the facts indicate that consolidating noncombatant functions would be more efficient, effective, or economical. When those conditions apply, the National Security Act gives the secretary of defense the responsibility and authority to provide for the performance of any such supply or service activities common to more than one military service. Thus, for example, both the Grace Defense Task Force and the Packard Commission recommended that DoD unify the command of global air, land, and sea transportation.

The Grace Commission's acquisition recommendations have provoked the greatest furor, however. Sometimes I think that is because they were not understood. At other times, I think they were understood all too well and simply not liked by those who might be affected.

In making those recommendations, the Grace Defense Task Force observed that under the existing process, separate organizations in each of the three services are acquiring major weapon systems. Each service also maintains its own personnel to perform acquisition management and administrative functions in areas such as contracting

Our recommendation for consolidation was not a rejection of decentralization. Indeed, it may very well be beneficial to decentralize along functional, specialty, or regional lines.

who feel that circumstances require an even more substantial departure from historic practice.

No one questions the fervor and dedication of those who believe that no substantive change is necessary. Strong resistance to consolidation and mandated service

and reporting, data processing systems, requests for proposals, interface with industry, and implementation of procurement regulations. The current system therefore results in massive duplication of effort among the services and between the services and the office of the secretary of defense.

At the same time, the acquisition organization now in place discourages optimization of total DoD procurement

³U.S. President, Executive Order, 12581, 51 Fed. Reg. 12,581 (1986).

Acquisition recommendations made by the Defense Task Force of the Grace Commission

	COST SAVINGS (IN MILLIONS OF DOLLARS)			
	Year 1	Year 2	Year 3	Total
OSD 15: Improve the organization of the acquisition function	Not quantified			
OSD 16: Consolidate contract administration at the OSD level	90.0	99.0	108.9	297.9
OSD 17: Simplify and streamline the acquisition regulations	Not quantified			
OSD 18: Eliminate regulatory constraints associated with contractors' recovery of IR&D functions	100.0	110.0	121.0	331.0
OSD 19: Require more effective coordination of research programs among the DoD laboratories	233.1	513.6	847.0	1,593.7
OSD 20: Require the use of common parts in weapon systems and allow tailoring of military standards	1,020.5	2,358.8	3,950.4	7,329.7
OSD 21: Limit the number of new weapons programs relative to projections of available dollars	222.9	490.4	809.2	1,522.5
OSD 22: Modify procedures to ensure more accurate estimates of weapons costs and assign monitoring responsibilities to DoD's comptroller	Not quantified			
OSD 23: Commit to stable 5-year spending plans and introduce multiyear procurement contracts where feasible	1,051.5	2,313.3	3,816.9	7,181.7
	2,718.0	5,885.1	9,653.4	18,256.5

services, when necessary. Interservice rivalry for procurement funds compounds the problem in another way as well. For, once selected, a weapon system develops a constituency within the service and within the Congress and industry.

The Grace Defense Task Force suggested that a more centralized approach to acquisition at the office of the secretary of defense level would reduce instability in the process. We felt that consolidation of acquisition management at this level would improve the focus and effectiveness of DoD's procurement effort.

Significantly, however, our recommendation for consolidation was not a rejection of decentralization. Indeed, it may very well be beneficial to decentralize along functional, specialty, or regional lines. The problem with the existing system, as we see it, is decentralization by service.

To remedy this, we recommended total consolidation of the acquisition function within the office of the secretary of defense, that is, all research and engineering functions under the under secretary of defense for research and engineering and all procurement and production functions under the proposed under secretary of defense for acquisition.

This proposal would remove the research and engineering and acquisition functions from the services. But the services would continue to play a major role in the acquisition

the acquisition agency responsible for meeting their needs at the agreed-upon cost and on the agreed-upon production schedule. Another key provision of our recommendation is that the services would retain test and evaluation responsibility as well as authority for accepting the final system.

As might be expected, given the charge of the Grace Commission, we believe that consolidated management of weapons acquisition holds the potential for saving billions of dollars—probably tens of billions—annually due to better decision-making. Significant progress in reducing program instability, with its attendant problems, is also likely. What's more, consolidated management would foster objectivity in making decisions to accept or reject competing programs and would allow DoD to present a single position on acquisition matters to Congress and to the public. Finally, it would facilitate promulgation of uniform procurement policies and procedures to control the acquisition process.

Clearly, the Defense Department will be under constantly increasing pressure to provide more defense capability with the resources made available to it. Therefore, the department must structure itself in a way that will make this possible and at the same time support the military functions as efficiently as possible.

As noted above, many have attempted to dismiss the recommendations of the Grace Commission's Defense Task Force. Their reasons vary, but I have found that by

would solve long-standing problems, even though others regard such reforms as heresy.

I think that the best way to confront the more common challenges is not to ignore them but to analyze each one. In testimony, interviews, and speeches, the questions most frequently posed are:

- Why should we listen to the Grace Commission when all it wanted to do was slash the defense budget?
- What did the Grace Defense Task Force know about defense, anyway?
- Didn't task force members understand the difference between civilian and military functions?
- Why don't you tell Congress? They won't let us do the things we know ought to be done.

Slashing the defense budget. Even a cursory reading of the Grace Defense Task Force report will reveal that we recommended 40 specific ways to realize annual savings of \$20 billion or more. But we said nothing about using these savings either to strengthen the nation's defense posture or to reduce the budget. That is a decision to be agreed upon by the Joint Chiefs of Staff, the secretary of defense, the president, and the Congress.

Some have also charged that our proposals would leave the country's military strength poised on the knife's edge between adequacy and inadequacy and that this is too risky a position for the national security. Such a view misconstrues the spirit of our recommendations.

The task force lacked the background to suggest a target position for preparedness and did not put one forward. Had we been in a position to do so, however, our target would not have been the dividing line between inadequacy

the Joint Chiefs. Our recommendations pertained to procurement, transportation, support services, personnel, compensation, financial controls, organizational planning, and other areas in which task force members had established professional competence.

Worth noting, in light of the unquestioned defense credentials of the Packard Commission, is that many of its recommendations are similar to those of the Grace Defense Task Force. For example, both groups advocate:

- Creation of an under secretary for acquisition.
- Substantially increased use of off-the-shelf components and systems.
- Reduced use of military specifications.
- Increased competition and use of commercial buying practices.
- Stabilization of programs by means of improved baselining methods.
- Stronger program management.
- Substantial reduction in the number of acquisition personnel.

Giving away acquisition to civilians. Perhaps the point that has caused the greatest misunderstanding is the widely held belief that the task force intended to remove military personnel fully from the acquisition process. Our recommendation (OSD 15) did not deal with who would do what in the acquisition process; it addressed only where the work would be done. The consolidation proposal is independent of the work force.

Program management by talented military personnel could be the cornerstone of consolidated acquisition in the office of the secretary of defense. As noted in the April

The obstacles to consolidation are cultural and psychological, not an integral part of any organizational structure.

and adequacy. It would have been the cutting edge separating deliberate redundancy from superfluous redundancy. The rub, of course, is finding that edge.

A subject for insiders only? Some contend that people not steeped in defense have no competence to make constructive suggestions and, using this rationale, they facilely dismiss the recommendations of the Grace Defense Task Force. That pretext also relieves them of the obligation to analyze the recommendations on the basis of intrinsic

1986 Packard Commission report on defense acquisition, "the caliber of uniformed military personnel engaged in program management has improved significantly of late," and currently, the report goes on to say, "military officers manage over 90 percent of DoD's roughly 240 program offices."⁴

The Packard Commission report also cites improvements needed in tenure for program managers, calling for

*The problem with the existing acquisition system,
as we see it, is decentralization by service.*

Management Journal, two-thirds of the military officers responding had been in their current jobs for less than three years, while only one-fourth of the higher-level civilian respondents reported that short a tenure. Another one-fourth of the civilian managers responding had been in their jobs for more than 15 years.

Improvements in the quality and tenure of military program managers would augur well for a consolidated defense acquisition system. Furthermore, consolidated acquisition in DoD would move the nation in a direction urged by President Dwight D. Eisenhower in 1958. He argued then that top officers should have interservice experience before they advance beyond two-star rank, so that they will have demonstrated "the capacity for dealing objectively—without extreme service partisanship—with matters of the broadest significance to our national security."⁵

Why don't you tell Congress?

We did—and we still do.

In its report, the Grace Defense Task Force noted the problem of micromanagement by the Congress and congressional staffs. We pointed out that in order to effect more than 80 percent of our projected cost savings, congressional action or concurrence would be required. In particular, we cited congressional blockage of base closings, the legislature's continued support of outdated or unrequested weapon systems, and other steps that interfere with efficient management of the Defense Department.

But Congress does not walk alone. When making a sale through DoD channels falls on deaf ears, each service finds congressional supporters to carry its water. On balance, though, a little congressional restraint would go a

had procurement responsibility as well as private-sector individuals knowledgeable about defense and private-sector procurement.

I do not point this out in order to assign responsibility for the specific recommendations elsewhere. The measures proposed were those of the task force, but they are better because of the helpful suggestions we received from those with whom we discussed them.

The obstacles to consolidation are cultural and psychological, not an integral part of any organizational structure. They have historical roots in the justifiable pride that each service has in its competence and traditions.

The need for cohesion of planning and weaponry, however, has never been greater. The success of interservice communication by the forces attacking Libya, compared to the communications snafus in Grenada, illustrate this. We cannot afford to learn these lessons through failures on the battlefield. The price may be too high next time.

The United States needs to consolidate defense procurement as a matter of military preparedness, interservice balance, strategic planning, and affordability. After four years of reflection, I remain convinced that the Grace Defense Task Force recommendation was then—and is now—a sound one. **DMJ**

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⁵Dwight D. Eisenhower, "Message to the Congress," April 3, 1958, as quoted in *Office of the Secretary of Defense Historical Office, The Department of Defense 1944-1978* (Washington, DC: Government Printing Office, 1978), p. 186.



DoD needs a professional acquisition corps

By ANDREA L. FISCHER

Legislative action and management initiatives alone will not improve defense acquisition; the work force that implements and administers those measures needs streamlining and flexibility too.

The Defense Department's acquisition work force is the foundation of all our efforts to improve the defense acquisition process. We cannot hope to solve the myriad problems in this area simply by establishing initiatives or proposing legislation. Defense acquisition will improve only in direct relationship to the availability and application of sufficient numbers of well-qualified professional personnel. The acquisition work force—from contracting personnel to engineers—has the challenge and responsibility to make good management ideas work. Talented individuals, using their know-how to properly interpret legal and regulatory requirements, can implement the sound, innovative measures DoD needs.

The Department of Defense currently has a good acquisition work force. Its members have done an admirable job, given the intense pressure and close public scrutiny they have been subject to over the past few years. Unfortunately, numerous procedural rules and regulations have in large measure turned senior-level acquisition management personnel into technocrats unable to make responsible decisions. The ripple effect has worked its way down through the rest of the work force, resulting in delays and overruns.

We need a DoD-wide program to enhance the acquisition work force and create a true career path for acquisition professionals. The department must be able to show an individual choosing acquisition as a career that he or she has a viable path to a professional career.

The nation now has a well-trained, well-balanced, well-motivated, and well-disciplined combat arms force that provides for our current defense commitments and serves as a solid foundation for the future. President Ronald Reagan has shown his continued commitment to this strong manpower posture by exempting essentially all military personnel accounts from Gramm-Rudman-Hollings cuts in fiscal year 1986. Without qualified, dedicated people to operate and maintain military equipment and fill our combat and support units, improvements in force structure and modernization would have been hollow at best.

The same is true of the acquisition work force. The Defense Department has to have qualified, capable decision-makers to develop and procure military equipment and supplies. Changes in pay structures, rotational programs, and training; more flexible DoD-wide personnel procedures; real opportunities for upward mobility; and rewards for experience and competence will help us attract and retain a talented cadre of professionals who have the proper backgrounds and experience.

Establishment of a defense acquisition corps of highly skilled personnel would serve as a basis for necessary personnel reforms. Individuals in that corps, comprised of experienced, well-educated civilian and military members, would work for one of the military services or defense agencies. But the department would have increased flexibility to move corps members to another service or agency

other clarification, particularly in the area of legislative support required. However, a defense acquisition corps would definitely provide the impetus needed to meet the complex challenges of defense acquisition management.

The concept has the support of the President's Blue Ribbon Commission on Defense Management, better known as the Packard Commission. In its words, "DoD must be able to attract, retain, and motivate well-qualified acquisition personnel."¹ The commission went on to say that "the Secretary of Defense should have increased authority to establish flexible personnel management policies necessary to improve defense acquisition."² In calling for an alternate personnel management system, commission members envisioned inclusion of senior acquisition personnel and contracting officers as well as scientists and engineers. They concluded:

*Federal regulations should establish business-related education and experience criteria for civilian contracting personnel, which will provide a basis for the professionalization of their career paths. Federal law should permit expanded opportunities for the education and training of all civilian acquisition personnel. This is necessary if DoD is to attract and retain the caliber of people necessary for a quality acquisition program.*³

Senators Dan Quayle and Jeff Bingaman have introduced legislation that would establish an alternative personnel management system for scientists, engineers, and acquisition personnel; on the House side, Congressman Dennis M. Heriel has proposed a system for acquisition professionals only. At the same time, the Department of Defense has been working with the White House, the Office of Personnel Management, and a Cabinet council to develop a bill for a governmentwide alternative personnel management system; following completion, it too will be introduced on Capitol Hill.

Obviously, an elite corps of acquisition professionals is an idea whose time has come. The Congress and the administration are headed in this direction, and private citizens favor the concept as well. A personnel system for acquisition professionals, military and civilian, should reduce overlap and at the same time provide an integrated basis for acquisition.

What form would such a corps take? One possible

central at this point is to call attention to the critical need for a professional, highly competent acquisition work force.

Establishment of a defense acquisition corps could proceed in accord with certain guidelines:

- The corps would comprise qualified civilian and military personnel in all acquisition-related fields as determined by the under secretary of defense for acquisition; it would number no more than 200,000 individuals, civilian and military.

- The basis for entry into the corps would be education, experience, training, and, depending on the level of entry, examination.

- The under secretary of defense (acquisition) and the assistant secretary of defense (force management and personnel) would prescribe salary classes for the corps similar to those used in the Navy's China Lake experimental program (for more details on this program, see "The Navy's experiment with pay, performance, and appraisal," Third Quarter 1985 *DMJ*). Basic salary rates would not exceed the maximum rate of basic pay for a member of the senior executive service.

- The same under and assistant secretaries would set promotion, retention, incentive, rotation, demotion, and removal procedures.

- Members of the acquisition corps would qualify for bonuses on the basis of achievement, that is, attaining and maintaining professional certification and holding contracting officer warrants; retaining selected critical skills would be a factor as well.

- DoD would set up a defense acquisition university that would encompass all existing acquisition-related defense schools. It would include separate colleges for functional specialties such as contracting and acquisition, logistics, quality assurance, program management, systems engineering, production, and manufacturing. Each college would be accredited and offer degrees. All students would take a core acquisition and contracting curriculum to assure a common understanding of mission roles and responsibilities.

- Finally, the under secretary of defense for acquisition and the assistant secretary of defense for force management and personnel would develop policies and programs for the recruiting, placement, training (including high-technology training), and development of career personnel in the defense acquisition corps.

Actual implementation of an acquisition corps in the Defense Department will require action on several fronts. Although the department can accomplish much in-house through DoD directives, legislation will be necessary in some areas. Legislation will also enhance the DoD initiatives, adding the credibility of congressional and presiden-

¹U.S. President's Blue Ribbon Commission on Defense Management, "An Interim Report to the President," Washington, DC, February 28, 1986, p. 1.

²Ibid., p. 16.

³Ibid., p. 17.

tial support.

What can happen in-house?

First, the secretary of defense can establish a senior defense acquisition council chaired by the under secretary of defense (acquisition) and composed of the senior procurement executive from each military department and the Defense Logistics Agency, the ranking senior procurement executive from the other defense agencies, a representative from the Joint Chiefs of Staff, and the assistant secretary of defense (force management and personnel). The council's charter would be to develop, maintain, and operate the defense acquisition corps; an executive secretariat, consisting of a director, associate directors, and support staff, would conduct the day-to-day affairs of the council. (No new hiring should be necessary. Consolidation of the personnel function—from each of the services and the Defense Logistics Agency—at this level should provide the additional people needed.)

Initial actions of the senior defense acquisition council would be issuance of a DoD directive establishing the defense acquisition corps, imposition of limitations on the flow of contracting authority, and establishment of the defense acquisition university discussed above.

With support and assistance from the office of the assistant secretary of defense (force management and personnel), the council would determine the specific civilian and military occupational series comprising the defense acquisition corps. Existing job functions and personnel not immediately eligible to join the corps would form a semiprofessional work force whose members could cross over to the corps after meeting professional requirements. The program for support of the general counsel in the military departments could serve as a model for structuring the defense acquisition corps.

The senior procurement executive of each DoD component—the services, the Defense Logistics Agency, and the office of the secretary of defense—would be responsible for:

- Assigning corps members throughout the component.
- Providing professional oversight, measuring competence, and administering awards and sanctions.
- Decisions to hire, fire, promote, or demote members.
- Ensuring that organizations served by the corps provide adequate administrative support.
- Managing the semiprofessional acquisition work force.

Only the senior procurement executive of a component would have contracting authority, which he or she could delegate to other acquisition corps members and the

would set forth this hierarchical acquisition support system in greater detail. The same directive would establish a peer review system to measure contracting officer performance.

The defense acquisition university would provide funding and policy direction for the defense acquisition corps training base. Collocated with the Defense Systems Management College, it would have the same commandant as well. All existing acquisition training facilities would pass to the university, which would ensure that the facilities and courses were adequate to meet defense acquisition corps requirements. It would also certify that individual corps members have mastered necessary acquisition competencies.

Other actions associated with setting up the corps will require that the senior defense acquisition council prepare legislative initiatives. For example, legislation will be necessary to establish professional requirements for the corps, rank-in-person, special salary scales to attract and keep top performers, a special bonus awards system, selection out of the corps for cause, and the right to grieve actions that deprive members of rights or benefits authorized by law or regulation. These legal provisions should also include a special senior acquisition executive rank similar to the senior executive service.

As the preceding overview indicates, the secretary of defense already has sufficient authority to implement a more controlled and effective acquisition system based on the defense acquisition corps concept. With appropriate supporting legislation, that corps will be able to attract and retain professional people who can make real improvements in defense acquisition. As the quality of the work force increases, the massive paperwork burden and long lead times that now exist on major programs can and will decrease. In addition, the overall size of the acquisition work force will drop significantly because fewer people will be needed to do the work.

Establishing a defense acquisition corps will enable DoD to tap the technological superiority of American industry and incorporate it in equipment that is essential to U.S. military forces. Our deterrent posture will benefit enormously as a result, giving all citizens of the free world the defense they need at reasonable cost. **DMJ**

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and weapon system procurement

HAROLD J. BRUMM JR.

*Is it time to abandon decentralized weapon system acquisition?
This article offers an overview of the issues involved.*

*There's many a slip 'twixt the cup and the lip.
—Palladas*

The seemingly interminable problem of rising weapon system costs has prompted a variety of recommended solutions.* Some of these have focused on cost estimating procedures and contracting reforms which, it is alleged, would impede cost growth.¹ Others have argued that organizational changes within the Department of Defense are a necessary condition, though probably not a sufficient one, to rein in the problem.²

One organizational change in particular has received at-

tention lately and is the subject of the present article. This reform initiative surfaced recently as a recommendation of the President's Private Sector Survey on Cost Control, also known as the Grace Commission. According to one analyst, the commission's defense task force made "the most sweeping recommendation concerning [weapon system] procurement organization since the end of World War II," namely, the complete centralization of all DoD weapon system acquisition activities.³ Specifically, the task force recommended "the total consolidation of the acquisition function at the OSD [office of the secretary of defense] level, i.e., research and engineering functions should be consolidated under the under secretary of defense for research and engineering and procurement and production should be consolidated under the [now nonexistent] under secretary of defense for acquisition (as proposed herein)."⁴

The acquisition process referred to involves decisions about the particular mix of systems to be developed, the capabilities to be sought in each system, the numbers of each system to be procured, and the management of the actual procurement contracts.⁵ An efficient process should produce decisions that result in either the most effective mix of weapon systems possible—however effectiveness is

*The views expressed in this paper are those of the author and do not necessarily reflect any official position of the U.S. General Accounting Office.

¹Examples include Dan C. Boger, Carl R. Jones, and Kevin C. Sontheimer, "What Are the Incentives in Incentive Contracts?" *Defense Management Journal*, First Quarter 1983, pp. 16-22; and General Accounting Office, DoD Needs to Provide More Credible Weapon System Cost Estimates to the Congress, NSIAD-84-70 (Washington, DC: General Accounting Office, May 24, 1984).

²For example, see Harold J. Brumm Jr., "Property Rights and the Cost Growth of Weapon Systems," *Defense Management Journal*, First Quarter 1983, pp. 23-27; Samuel P. Huntington, "Defense Organization and Military Strategy," *Public Interest*, Spring 1984, pp. 20-46; and John Steinbruner and Barry Carter, "Organizational and Political Dimensions of the Strategic Posture: The Problems of Reform," *Daedalus*, Summer 1975, pp. 131-154.

³David E. Lockwood, U.S. Weapons Procurement: Should a Civilian Agency Be in Charge? *Report No. 84-61F* (Washington, DC: Library of Congress, Congressional Research Service, June 13, 1984), pp. 31-32.

⁴U.S. President's Private Sector Survey on Cost Control, Report on the Office of the Secretary of Defense (Washington, DC: Government Printing Office, September 15, 1984), p. 143.

current decentralized process, and this is the principal assertion of those who favor centralizing authority for these activities.⁷ But it is also possible that a process more decentralized than the present one would be more efficient than either the current process or a more centralized one.

The discussion that follows will focus on some of the efficiency gains attributable to a decentralized process, gains which could be lost through centralization. The objective is to stimulate a dialogue on several key questions: How likely are we to experience efficiency losses from greater centralization? Are those losses likely to be as great as the potential gains from greater centralization? Would other reforms which involved greater decentralization perhaps contribute to a more efficient acquisition process?

To some, the notion that weapon system procurement is likely to become more efficient under centralized authority in a single agency may seem odd. The commonly accepted precept in the private sector is that competition, or the "struggle, fight, maneuvering, bluff, [and] hiding of information,"⁸ among firms producing similar products enhances efficiency. Yet much is claimed for the single agency concept. Recently, for example, one observer has alleged that:

The major reason for the high defense budget can be directly attributed to a bureaucratic system which allows each military service to pursue its own self-interests in the areas of weapon systems development and acquisition. The result is a process where duplication of efforts and the procurement of a multitude of peculiar defense systems are commonplace.⁹

⁷In this article, the terms "procurement" and "acquisition" will be used interchangeably (although, as usually employed, acquisition encompasses research, development, testing, and engineering as well as procurement) and somewhat ambiguously (although their meanings will be clear from the context in which they are used).

⁸The term "effective" will be used in the general sense of "making good use or making the best use of available resources." For further discussion, see Charles J. Hitch and Roland N. McKean, *The Economics of Defense in the Nuclear Age* (Cambridge, MA: Harvard University Press, 1960), pp. 105-138.

⁹"An Alternative to Reduce Defense Spending," Government Executive, April 1984, p. 38.

⁸Oskar Morgenstern, "Thirteen Critical Points in Contemporary Economic Theory: An Interpretation," *Journal of Economic Literature*, December 1972, p. 1171.

However, the view that duplication of effort in such systems inevitably is wasteful ignores the possibility that the flow from such parallel development may well be worth their cost. If that view is correct, the pursuit of multiple approaches to a certain task such as providing national defense is a sensible strategy. Jacob Stockfish, who has written extensively on the subject, states the case to be made:

[S]ervice rivalry over budgets [has] led to some worthwhile results. The Navy won out over the Air Force in the development of the Polaris submarine missile. The Navy won out over the Air Force in the development of the Trident missile. Today, with growing dependence on sea-based missiles, few would fault the Navy's strategic triad.¹²

Another apparent virtue of procurement in a single agency is that the resultant structure would fix responsibility for a task. In the current structure, under which firms are responsible for a task (popularly known as ticket-punching), it is virtually impossible to hold an officer's career, makes establishing responsibility virtually impossible.¹³ While this is true, several analysts nonetheless maintain that centralizing weapon system procurement may, at a minimum, need closer scrutiny than one of the skeptics:

Critics [of the services' procurement] have found, for example, that the Air Force buys a specific item than the Navy. The Air Force there was "waste" and seemed to be an agency to buy the item for all se

⁹"An Alternative," p. 38.

¹⁰*Ibid.*, p. 38.

¹¹For example, see his *Plowshares* (New York: Mason and Lipscomb, 1973).

¹²Jacob A. Stockfish, "Removing Budget Incentives," *Backgrounders*, No. 1, DC: Heritage Foundation, June 19, 1984.

¹³C. Lincoln Hoewing, "Improving the Acquisition Process," *Backgrounders*, No. 2, DC: Heritage Foundation, November 2, 1984. That this objective could be accomplished by centralizing the weapons procurement process would be to have each military department responsible for its own procurement career track for officers, and extend the length of the career track.

with this reasoning is the assumption that the centralized agency can buy everything at the lowest price. In fact, a single agency is more likely to pay a higher price, because there is no immediate basis for the kind of comparisons available to more immediate overseers and hence less incentive to manage diligently.¹⁴

William Niskanen, formerly a member of the President's Council of Economic Advisors, has done a theoretical analysis that is relevant to the procurement centralization proposal. In his landmark work, *Bureaucracy and Representative Government*, Niskanen considers what might happen if a centralized bureaucracy were to assume responsibility for providing a public-sector product or service.¹⁵ His analysis begins with the assumption that the bureau possesses a monopoly over the product or service it supplies. The bureaucratic monopolist is in a somewhat different position from the private-sector monopolist, however. The latter tries to produce the output level that maximizes profit, the difference between total revenue from sales and total cost of production.¹⁶ A bureaucrat, on the other hand, does not have property rights to the bureau's fiscal residuum, the difference between tax dollars collected for provision of the public good or service and the minimum cost of producing that good or service. Consequently, bureaucrats can capture the fiscal residuum only indirectly through budget expansion. The bureau's objective, therefore, is budget maximization.¹⁷

Niskanen argues that the source of the bureau's monopoly power is the budgetary process itself. A bureau bargains with legislative appropriations committees on the basis of a total budget. Whereas a private-sector monopolist offers units of output at a price, the bureau offers a particular level and mix of total output in exchange for a budget. It would seem, however, that the fiscal purchaser, that is, the legislature, must buy at an all-or-nothing price.¹⁸

The hypothesis is that the bureau can, and will, exploit the full "profit" from its monopoly and then use this fiscal

residuum to subsidize additional production which, from the standpoint of Congress, is actually not worth its costs."¹⁹ By definition, this total output is socially inefficient. In reality, however, the assumption of a take-it-or-leave-it bureaucratic bargaining strategy, one of the cornerstones of Niskanen's analysis, would appear to be implausible. Nevertheless, for reasons that will become clear shortly, Niskanen's theory provides insights into the weapon system procurement process.

As a general proposition, the legislature can always use the threat of budget cuts to compel an agency to produce a particular output level or mix. Whether or not this particular level or mix even approximates one that is socially efficient is, of course, unknown. And information required for knowledgeable decisions about socially desirable output levels or mixes is not a free good. Acquiring knowledge about actual costs of different production levels or mixes is itself costly, if only in terms of the time and effort involved. Obtaining it becomes even more costly due to the bureau's tendency to further its own ends by obscuring such information.²⁰ But the implausibility of Niskanen's assumption about bureaucratic bargaining strategy does not necessarily vitiate his overproduction (budget expansion) hypothesis.

Whether or not one bureau has centralized authority for procuring weapon systems, pulling and hauling among competing procurement interests within DoD will inevitably occur. (Of course, Congress and congressional staff are players in this arena, too, but a discussion of their role is beyond the scope of this article.) Other things being equal, the greater the decentralization of procurement authority, the more likely it is that the strengths and weaknesses of competing arguments will surface. In the battle over limited budgetary resources, each group will attempt to cast its own case in the most favorable light and, if only by inference, to discredit that of its competitors. As a result, the taxpayers' elected representatives will have more information on which to base appropriations decisions.²¹

If, on the other hand, procurement authority is the exclusive prerogative of just one bureau, such competition will tend to go underground. For it will be in the bureau's self-interest to suppress negative and highlight only positive information. Stockfish has summarized the situation:

To the extent that it is a motivation of a government agency or bureau to maximize its budget, its information and reporting system cannot help but be influenced by this incentive. If the [bureau's] budget

¹⁴Stockfish, "Removing the Pentagon's Perverse Budget Incentives," p. 2.

¹⁵William A. Niskanen, *Bureaucracy and Representative Government* (Chicago: Aldine-Atherton, 1971). Also see William A. Niskanen, "Bureaucrats and Politicians," *Journal of Law and Economics*, December 1975, pp. 617-643.

¹⁶For further discussion of the neoclassical economic theory of the monopoly firm, see any microeconomics textbook, for example, Edman K. ...

*has to be justified in a detailed way [to the legislature], whereby the total is the sum of many items, each of which is scrutinized and approved by the higher authority, information on each of these items will be influenced by the budgetary incentive. Hence, subordinate agencies have incentives to provide only the most favorable information or even to fabricate information.*²²

If the bureau or its components manipulate data, then weapon system procurement decisions may diverge from those that the taxpayers' representatives desire, a socially inefficient outcome. Granted, members of a monopolistic bureau will differ in their individual aspirations and preferences. And in the face of divergent preferences, choices among alternative weapon systems is problematic, leading

competing agency would open itself to congressional budgetary reprisals.

Economists have analyzed the relationship between information distortion and cost increases, and Kenneth Boulding has summarized their findings:

There is a great deal of evidence that almost all organizational structures tend to produce false images in the decision-maker, and that the larger and more authoritarian the organization, the better the chance that its top decision-makers will be operating in purely imaginary worlds. This perhaps is the most fundamental reason for supposing that there are ultimately diminishing returns to scale²⁴ [and, therefore, rising costs].²⁵

Since "large" and "authoritarian" aptly describe DoD, the

How likely are we to experience efficiency losses from greater centralization? Are those losses likely to be as great as the potential gains from greater centralization? Would other reforms which involved greater decentralization perhaps contribute to a more efficient acquisition process?

to internal bargaining based on some form of side payments and trading among competing groups. The point is that this activity will take place internally and hence may not be subject to as much outside scrutiny if authority is centralized in one bureau.

Evidence that bureaus tend to cast the information they supply in the most favorable light is abundant. The military departments have submitted overly optimistic weapon system cost estimates to the Congress in many instances, and these are well-documented.²³ Given the frequency of such overoptimism, Niskanen's overproduction hypothesis would seem to have some relevance. Clearly, one could argue that, despite all the problems with the current organizational arrangement, bureaucratic competition does generate more reliable information on costs and alternatives than would otherwise be forthcoming. A bureau that estab-

idea that further centralization and policing of weapons acquisition activities within one office will lead to increased efficiencies may need to be rethought.

Some public policy analysts, after reviewing the procurement histories of particular weapon systems, have concluded that DoD needs more, not less, bureaucratic competition. While at Harvard University in 1975, John Steinbruner and Barry Carter, writing about problems that had beset the F-111 aircraft and Trident submarine programs, surmised that DoD budgetary procedures "should be changed to stimulate competition between the services

²⁴Returns to scale describes output response to a proportionate increase in all inputs required for the production of that output

and possibly within each service."²⁶ The Brookings Institution's Thomas McNaugher reached the same conclusion based on his survey of the controversies surrounding acquisition of the M16 rifle.²⁷

In order to increase competition, Steinbruner and Carter proposed altering the secretary of defense's fiscal guidance issued to the military services every January at the beginning of the annual budget cycle.²⁸ This guidance, according to the two analysts, "provides no occasion for the services to comment directly on one another's share [of the proposed DoD budget]. Each service should be directed to accompany any request for more funds with a careful explanation of where these funds can be obtained from the budget of another service or from its own programs."²⁹

One of Niskanen's principal conclusions is that a monopolistic bureau can effectively keep the legislature in the dark and will, therefore, produce an output level that is beyond the socially efficient one.³⁰ Such overproduction is, of course, a social waste; the bureau employs too many resources. If the bureau lowered its output (ideally to the socially efficient one), some of its resources would then become available for producing other goods and services.

If the results of Niskanen's analysis are even approximately correct (only the most naive would argue that competition is a panacea), proposals to centralize responsibility for weapon system procurement in one bureau merit careful deliberation before being implemented. Indeed, officials should perhaps consider moving in the opposite direction—away from bureaucratic centralization and toward more bureaucratic competition. Niskanen recommends that, as a matter of policy, at least two bureaus should be allowed the opportunity to produce the same output and compete for the congressional funds budgeted for that output.³¹

Were the bureaus to compete, they would have an incentive for operating at a more socially efficient level—or

otherwise run the risk of congressional disfavor and resultant budgetary consequences. Absent the existence of competitors, the bureau has a decidedly greater chance of successfully withholding information about costs and alternatives. In a competitive environment, failure to comply with the legislature's request for information would give the competitor an opportunity to curry lawmakers' favor when annual budgets were allocated among agencies.

Experience in fact bears out the proposition that competition can induce agencies to function in a manner more consistent with congressional wishes. During the Vietnam conflict, the Navy lost turf to the Coast Guard because naval officials maintained that surface combat vessels had to meet minimum size requirements. Neither the Army nor the Air Force posed a competitive threat to the Navy, for all three organizations were signatories to the 1947 Key West Agreement, which was an "agreement among the military services to divide the major missions along bureau lines."³² Though that agreement precluded the Army and Air Force from stepping in, the Coast Guard, an agency of the Department of Transportation, was not so constrained. The latter agency willingly took the congressional dollars to procure and man small combat vessels in order to patrol the rivers of Vietnam.³³ In other words, the Coast Guard provided the product Congress wanted at the price Congress was willing to pay—a socially efficient outcome.

Economists Richard McKenzie and Gordon Tullock have suggested that the Navy may have learned an important lesson from this experience: "[I]f we have another war of this sort, the Navy will not again try to game the Congress into giving them larger vessels than necessary because they will anticipate the loss of part of their budget to the Coast Guard."³⁴ Furthermore, McKenzie and Tullock argue that there is "no reason why Congress and the President should not encourage individual bureaus to propose the takeover of part or all of the duties of other bureaus at a better price and with better service."³⁵ Thus the larger lesson may be that, if permitted to function, bureaucratic competition, not centralization of authority, will be more likely to foster social efficiency in weapon system acquisition. **DMJ**

²⁷Thomas L. McNaugher, *The M16 Controversies* (New York: Praeger, 1984), p. 182.

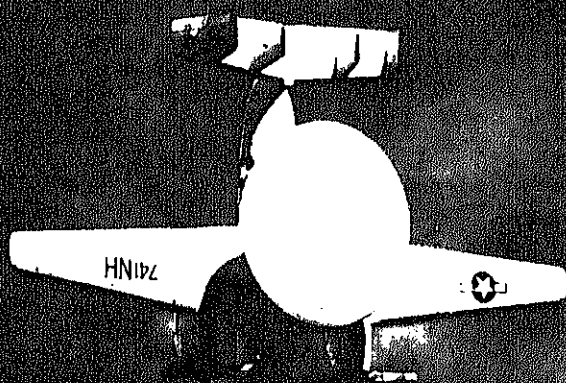
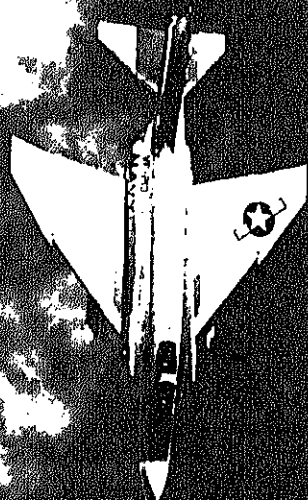
²⁸General Accounting Office, *Joint DoDIGAO Working Group on PPBS, The Defense Department's Planning, Programming, and Budgeting*, GAO/OACG-84-5 (Washington, DC: General Accounting Office, September 1983), pp. 13-14.

²⁹Steinbruner and Carter, "Organizational and Political Dimensions," p. 150.

³⁰Niskanen, *Bureaucracy*, p. 47.

³¹*Ibid.*, pp. 195-201.

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Implications of tactical air cost and performance trends

By ELLEN A. CHERNIAVSKY

and

LIEUTENANT COLONEL EDWARD T. TIMPERLAKE, USMCR

Do we get what we pay for in weapon systems acquisition?

The article below outlines an approach that sheds new light on an issue that has generated heated debate in the past.

Many observers believe that the decline in defense spending in the 1970s bequeathed to the United States a "heritage of weakness." Over the last decade, according to some analysts, the Soviets have closed the gap in conventional military-force capability that existed in 1970 and may even have achieved superiority.¹ The U.S. is pursuing force modernization to help redress the imbalance, and thus far in the 1980s, the nation appears to have reached a consensus on the importance of this initiative in strengthening the defense posture. At the same time, concern over the resources such an effort will consume has underscored the need for wise and cost-effective defense expenditure decisions.

Given the current political and fiscal climate, the renewed emphasis on force modernization raises two key issues. First, how do we measure the relative strengths of U.S. and Soviet weapon systems? Without such a measure, the nation is ill-equipped to determine the extent of force modernization needed. Second, how do we estimate the cost of acquiring increased force capability and then determine the most cost-effective strategy for doing so? This article describes a study which addresses these issues.²

The study had a twofold purpose. One objective was to develop a methodology that would permit qualitative comparison of U.S. and Soviet weapon systems in order to measure modernization rates. The second was to relate acquisition costs to performance characteristics.

Tactical aircraft were the focus of the study. We formulated a model that provides relative performance figures of merit and assembled a data base on the procurement costs of tactical aircraft. By analyzing the cost data and performance figures, we were able to draw conclusions about which procurement strategies should enable the U.S. to acquire tactical aircraft in the most cost-effective manner.

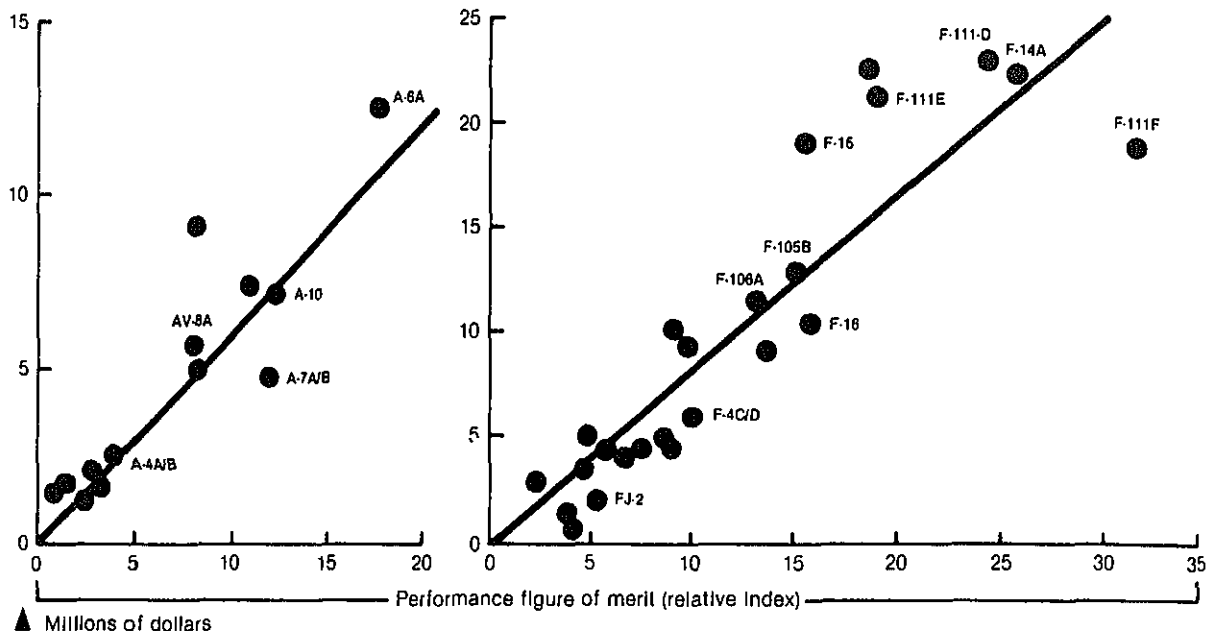
Figures of merit for tactical aircraft

To derive relative performance figures of merit, we used the technique for assessing comparative force modernization, a model more commonly referred to as TASCFORM-

¹See especially Elmo R. Zumwalt Jr., "A Heritage of Weakness: An Assessment of the 1970s," in W. Scott Thompson, ed., *National Security in the 1980s: From Weakness to Strength* (San Francisco, CA: Institute for Contemporary Studies, 1980), pp. 17-51.

²E. A. Cherniavsky, and E. T. Timperlake, "Tactic

Figure 1. The relationship between cumulative average cost of tactical aircraft and their performance figure of merit indicates that "we get what we pay for"



AIR. Working with this model, analysts can evaluate the five figures of merit for aircraft:

- *Airframe performance*, or the characteristics of the basic airframe and powerplant.
- *Aircraft system performance*, which includes both airframe performance and the capabilities acquired through on-board systems, that is, avionics and armament.
- *Adjusted airframe system performance*, that is, aircraft system performance modified to incorporate sortie rates and the age of the aircraft (the assumption is that a

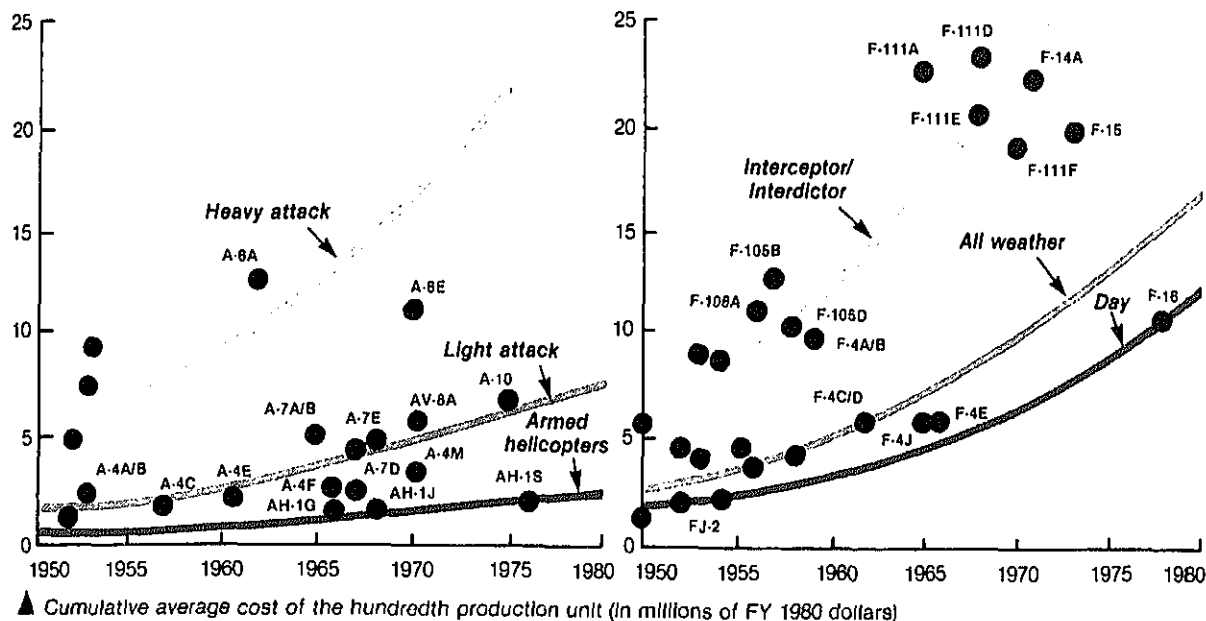
communications features; and multi-role capability.

In the TASCFORM-AIR methodology, tactical aircraft functions comprise the overall mission. The two submissions are air-to-ground and air-to-air; the roles in the former are close air support, interdiction, and attack helicopter. Fighter and interceptor are the two roles in the latter. Payload, range, maneuverability, and useful airspeed were the physical parameters considered in evaluating airframe performance.

For each figure of merit, we combined the physical

Underestimating costs initially and reducing quantities in response is doubly detrimental: the nation gets fewer aircraft and gets them at greater cost than necessary.

Figure 2. Between 1950 and 1980, production costs increased some 6 percent per year regardless of the type of tactical aircraft



and then summing the results. The weighting factors, determined through consultation with experienced operators, represented the rate at which airframe performance is enhanced as the characteristics of the aircraft improve relative to the F-4B in each of the five roles.³

Aircraft system performance is akin to the technological effectiveness of on-board systems against a reactive enemy during an aircraft's operational lifetime. To represent this figure of merit, we used a multiplicative utility function which equaled survivability times airframe performance modified to incorporate the capabilities of on-board systems. The function for designated force performance was equal to the sum of aircraft system performance figures for all types of aircraft, modified to reflect obsolescence, times the number of aircraft in the inventory.

The TASCFORM-AIR methodology used to derive these figures of merit does have some limitations. Specifically, it produces only dimensionless, relative numbers which reflect technological potential; such data are not indicators of combat effectiveness. The methodology does

not quantify the effect of aircrew proficiency, for example. Thus, these individual aircraft and force figures of merit are not valid tools for predicting the outcome of engagements or conflicts.

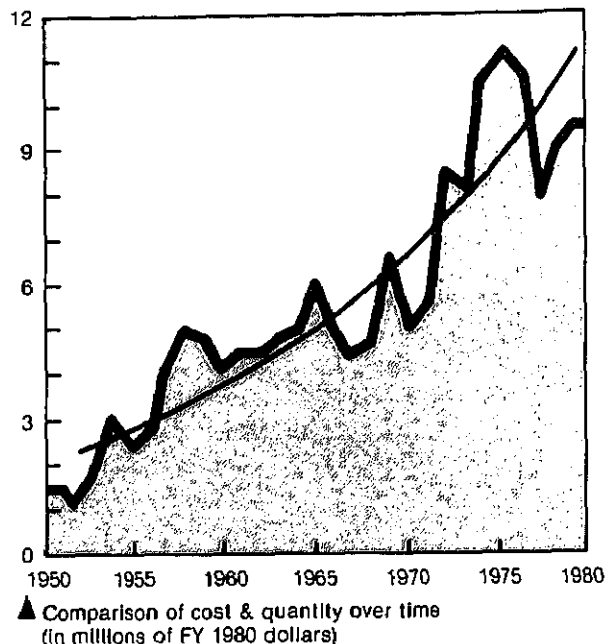
The two figures of merit that relate most closely to costs are aircraft system performance and designated force performance. Clearly, the first is a function of airframe, engine, avionics, and armament costs. And because costs are also a function of the numbers of aircraft procured, the second figure of merit is also relevant.

Cost data

The services provided data on technical aircraft production procurement costs to use in conjunction with the TASCFORM-AIR methodology.⁴ For each type, model, and series, the data consisted of the number of aircraft procured each year and the total obligational authority in then-year dollars. The data also included information pertaining to component costs, when available. For the majority of aircraft, we were able to break down total obligational authority dollars into five categories: airframe, engine, elec-

³ E. A. G. ...

Figure 3. Average unit costs of tactical aircraft have risen 6 percent per year since 1950



tronics, armament, and other.

In attempting to develop a cost-performance relationship, our first step was to convert then-year dollars into constant dollars in order to eliminate the effects of inflation. We did so using deflators supplied by the Defense Department's comptroller.⁵ These deflators for total

an appropriate tool.⁶ The theory underlying it holds that unit cost decreases as cumulative output increases for two reasons—workers become familiar with the operations required by the job and therefore develop tools and techniques to perform more efficiently, and management finds better ways to organize and coordinate the manufacturing process. When graphed on log-log paper, the learning curve is actually a straight line.

In the past, analysts have generally applied the learning curve to airframes alone or to engines alone and have expressed the curve in terms of direct labor requirements. The cost data used in our study were far more aggregate, comprising all components of aircraft cost. Even so, the learning curve provided a reasonable fit to the data in most cases. We determined learning curves, and from them, cumulative average costs, at the one-hundredth production unit. This measure offered a consistent standard by which to compare aircraft costs to their performance.

The cost-performance analysis

Figure 1 on p. 20 displays the results of plotting cost versus the performance figure of merit for both high-performance (generally F-designation) and low-performance aircraft. In general, the focus was on first-of-series aircraft. Those procured later have benefited from learning on the airframe or engine (or on both); they may therefore have a higher performance figure of merit but lower cost than their predecessors.

As the figure shows, the relationship between cumulative average cost at the one-hundredth production unit and the figure of merit for aircraft system performance appears

The Soviets appear to build far more of a given type of tactical aircraft than the United States does; as a result, they probably derive far greater advantage from the learning curve.

obligational authority included all procurement, not just aircraft.

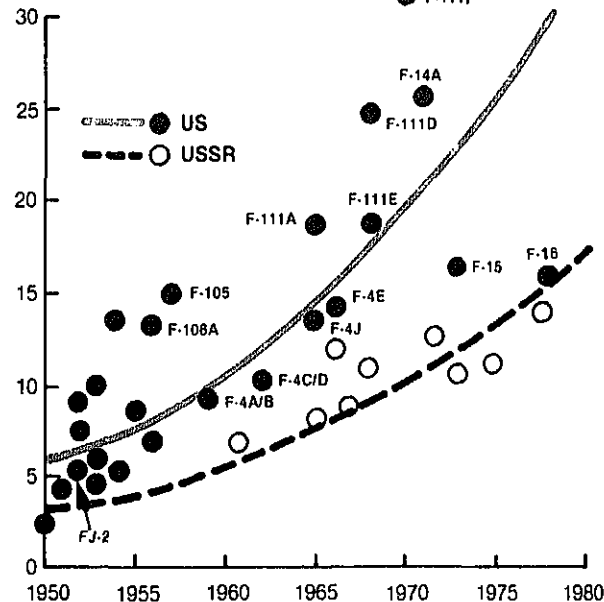
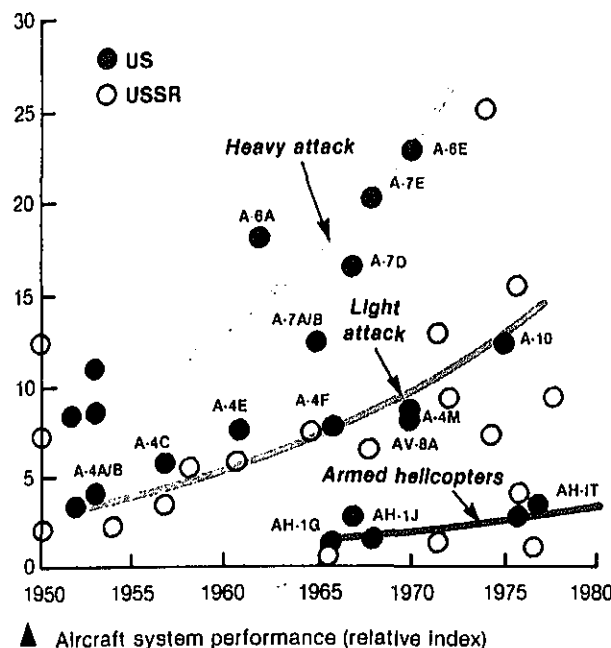
Next, we computed a standardized cost figure for each aircraft in the data base. This step involved fitting a learning curve to data expressed in terms of cumulative quantity and cumulative average cost.

For more than 40 years, researchers have used the learn-

to be linear. In other words, we get what we pay for. This is an important finding because some have expressed fear

⁶See, for example, H. Asher, *Cost-Quantity Relationships in the Airframe Industry, Report 291* (Santa Monica, CA: The Rand Corp., 1964).

Figure 4. Trends in performance over time show that Soviet high-performance tactical aircraft have clearly lower figures of merit than equivalent U.S. fighters



that emphasis on state-of-the-art technology will push up costs disproportionately.

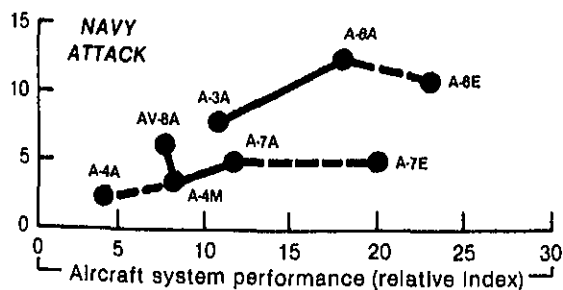
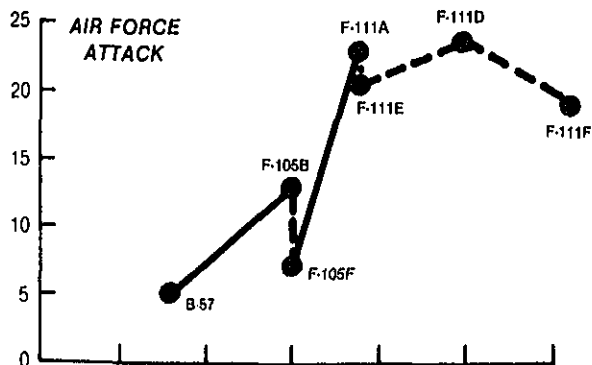
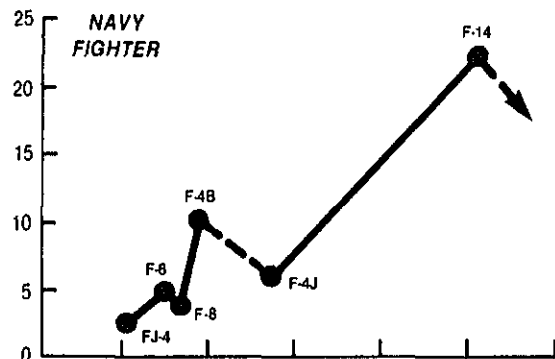
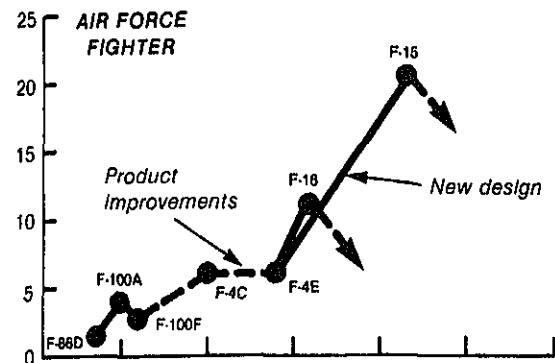
A straight line and a log-linear curve with a positive slope can be quite close together over a broad range. The log-linear curve and any straight line with a positive slope passing through the origin intersect both at the origin and at one other point. The log-linear curve lies below the straight line until that point and then begins to shoot up steeply. However, our results do not show the sharp increase in cost due to added performance that is typical of this sort of curve. Further statistical analyses will be necessary to confirm or disprove this finding.

Figure 2 on p. 21 offers a perspective on cost based on trends over time. The years for which costs are given are those in which production procurement first took place, and one can see that cost appears to have been increasing at roughly 6 percent per year in constant dollars over the last 30 years. This finding agrees with that of the International Institute for Strategic Studies, which reports that "most Western countries must now face something approaching a 6-percent annual average rise in (weapon) unit costs in real terms."⁷ An analysis of procurement dollars versus quantity purchased indicates that the 6 percent figure

is correct. As Figure 3 indicates, the trend has been toward more costly aircraft, with a unit cost growth of about 6 percent per year.

Our study also considered trends in performance over time and included a comparison of U.S. and Soviet low-performance and high-performance aircraft. The data in Figure 4 show that the low-performance aircraft of the two countries are virtually indistinguishable. However, Soviet high-performance aircraft clearly have lower figures of merit.

As noted earlier, one purpose of the study was to evaluate the modernization of U.S. and Soviet tactical air forces. In doing so, we derived designated force performance figures of merit for both and then plotted the results (see Figure 5 on p. 24). Soviet designated force performance appears to exceed that of the U.S., according to our analysis. The numbers calculated for this figure of merit can serve as an index to the relative standing of the two countries and can also be linked to investment. Figures based on a computation of dollar-analogue costs for Soviet investment over the last decade suggest that the Soviets spent about 24 percent more than the U.S. on tactical aircraft during that 10-year period. This estimate corresponds



▲ Cumulative average cost of the hundredth

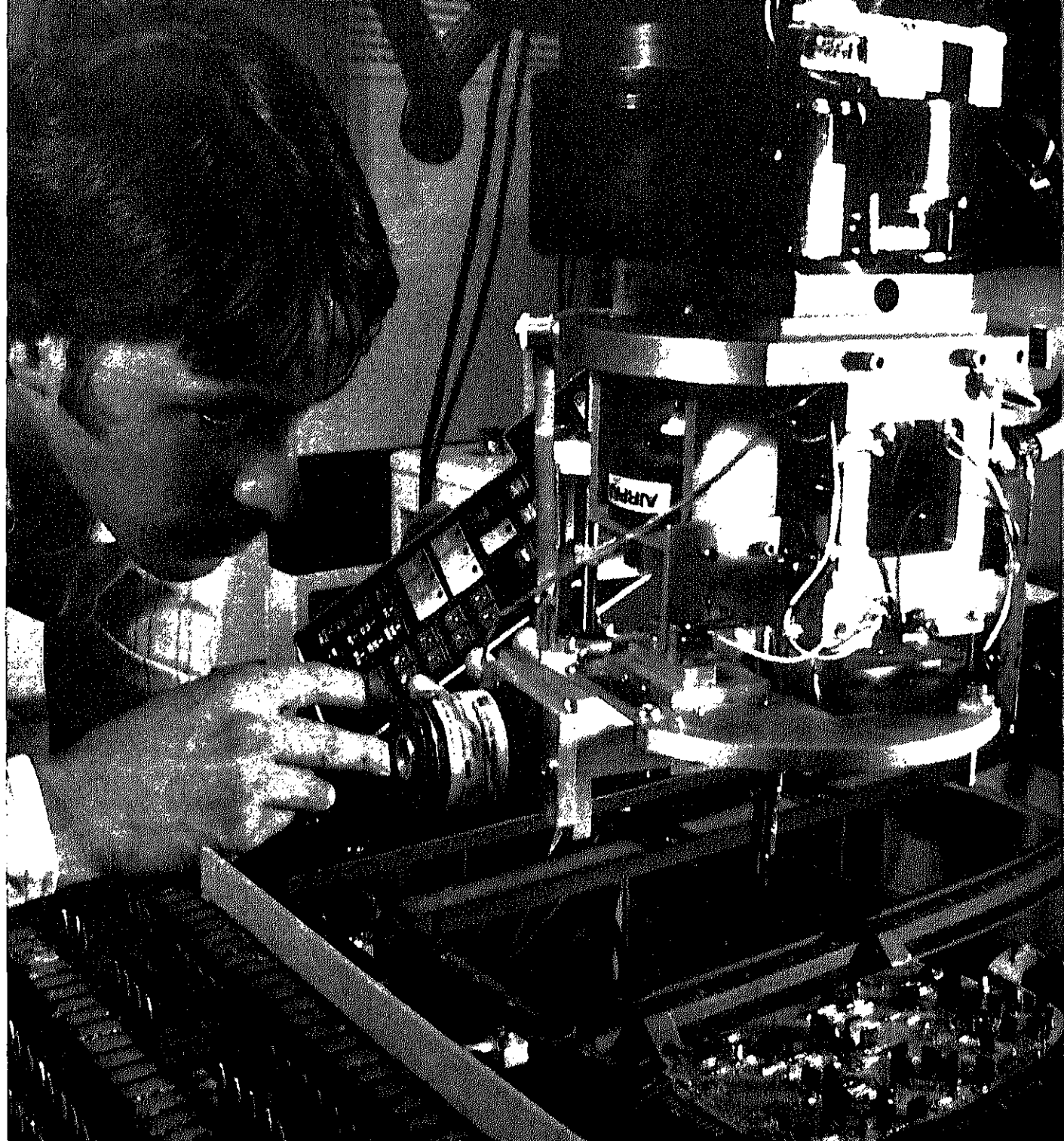
els. Because certain factors of production—inventory clerks, for example—are indivisible, scaling down production inevitably increases unit costs. Actual cost data show sharp unit increases when production rates drop by half, and similar difficulties occur when procurement is interrupted, no doubt due to the start-up costs incurred.

Unexpected increases in lot size can be detrimental as well, even though they mean more aircraft over which to spread overhead costs. Because manufacturers must hire additional personnel or perform new tooling, costs increase. The cost data include several instances of such unit cost increases when procurement lot size doubled. These are especially important in the context of surge capacity.

In sum, underestimating costs initially and reducing quantities in response is doubly detrimental: the nation gets fewer aircraft and gets them at greater cost than necessary. Fortunately, new initiatives in realistic budgeting can help reduce the frequency with which this occurs. In tandem with the acquisition strategies just discussed—product improvement, extended production, and constant production rates—they have enormous potential as cost-effective measures for coping with rising defense requirements and can help the U.S. get more aircraft for its money. The value of the TASCFORM-AIR methodology to defense managers, as our study demonstrated, is the means it provides to achieving such ends. **DMJ**

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How the Air Force is energizing the electronics industrial base

By THOMAS J. GELLI

By freeing contractors from overly stringent specifications and inducing them to modernize their production lines, the Air Force is short-circuiting supply and reliability problems that have characterized military electronics manufacturing in the past.

Just a country mile or so from the bridge where embattled farmers stood some two centuries ago and "fired the shot heard round the world," another revolution is under way. And while this one may not boast the romantic lore of minutemen and moonlit horseback rides, it too is asserting American independence from undue foreign influence. In this case, however, the enemy is not a red-coated army or tyranny from across the ocean, but rather an aging military electronics industrial base that may no longer be able to respond adequately to a midnight call to arms.

At the Air Force Systems Command's Electronic Systems Division, headquartered at Hanscom AFB in Bedford, Massachusetts, officials are waging a multifront campaign to improve the posture of the U.S. military electronics manufacturing base and ensure the quality, reliability, and affordability of the systems it produces. The task is as formidable as it is urgent. Air Force electronics requirements carry an annual price tag of some \$7 billion, roughly a third of the service's entire procurement budget. Nearly half of the cost of the \$16-million F-16, for example, is for electronics subassemblies.

Highly complex and sophisticated, Air Force electronics

systems sense, transmit, compile, analyze, display, compare, and store information. When necessary, they also launch, guide, and trigger a response. These systems are the essence of the U.S. military's force-multiplication capability, which is so highly critical to national security given the numerical advantage of our potential adversaries.¹

Complicating matters, electronics technology is advancing at breakneck pace. What is considered state-of-the-art one month may be passé the next. Without constant technical advancement and carefully planned factory modernization, eminence in the world of electronics technology can indeed prove elusive.

Whether the United States has lost this lead in recent years is a point of contention, but one development definitely does give defense strategists cause for concern: much of America's sophisticated weaponry is increasingly dependent on electronics components produced in Japan. This Pacific island nation, whose products were not long ago the target of playful derision, is offering militarily applicable, high-technology electronics at prices domestic suppliers cannot match.

Market analysts do not know just what percentage of U.S. military electronics components are imports. The figure is difficult to pin down because U.S. contractors do

chip chips found in American military hardware. Unlike aerospace and other more militarily oriented industries, the U.S. electronics sector has all but severed its major financial ties with the Defense Department, a development that further dismays government officials. In 1985, the DoD share of the U.S. semiconductor market was 7 percent. If current trends continue, that figure will drop to 3 percent by 1995.³ In other words, as military demand for electronics items expands, DoD may find itself increasingly reliant on foreign suppliers.

Sector management

In an effort to improve the responsiveness of all defense-related industrial arenas, especially electronics, the Air Force introduced a sector management approach three years ago. Under this concept, each Air Force product division—aeronautical systems, armament, space, and electronics—conducts industrial base planning for its own commodity area. Division planners pay particular attention to each sector's capacity to satisfy surge requirements in time of mobilization or national emergency. Their final reports are consolidated into the Air Force's annual production base analysis.

The Electronic Systems Division's sector management center keeps abreast of all electronics industrial base issues. Working closely with key industrialists, the center is taking bold steps to modernize electronics production lines and enhance the producibility and quality of electronics components and systems. It is doing so not through harangue and hard sell, but rather through mutually beneficial relationships with the sector's leading companies. Foremost among the organization's goals are development of an electronics industrial base that can provide critical items in time of crisis or mobilization and satisfy the product requirements outlined in the division's five-year peacetime procurement program.

Officials at the electronics sector management center are further refining producibility guidelines as described in DoD Manual 4243.7, "Transitioning from Development to Production." The chore is a rigorous one because producibility guidelines for electronics items are extremely difficult to quantify. True, contractors have developed such guidelines for their design engineers, but for the most part these ensure only that the item can be produced, not that it

of surge. Air Force officials hardly expect U.S. electronics makers to set aside certain production facilities that could be activated to meet surge requirements. They do, however, want electronics manufacturers to avail themselves of technologies and processes that will assure a flexible and efficient production base—one capable of quickly and smoothly converting from commercial to military orientation. Given the high cost of achieving such flexibility, U.S. electronics producers, awash with commercial orders and put off by the unpredictability of military procurement, have been reluctant to plunge dollars into "speculative" modernization ventures. But that situation appears to be changing, thanks to a new program that is disposing electronics executives to take a more favorable view of defense business and plant modernization.

Incentives for efficiency

At center stage in the Air Force's effort to spur modernization in the military electronics industrial base is the GET PRICE (Get Productivity Realized through Incentivizing Contractor Efficiency) program. While the acronym may have linguists grimacing, the program itself has Air Force officials, industry executives, and American taxpayers smiling.

Under GET PRICE, which is a direct descendant of the Industrial Modernization Incentives Program approach that the Air Force unveiled in 1978 (see p. 41), the government and the electronics manufacturers contractually agree to share some of the cost savings resulting from the contractor's factory modernization. Essentially, the program assures the contractor a fair return on investment in manufacturing technologies that have military application. The arrangement benefits both parties. The Air Force gets higher-quality, lower-priced products and a stronger, more responsive electronics industrial base; the contractor gets a modern factory and increased productivity.

Service officials hope this incentive approach will supplant the traditional cost-based approach, which, according to now-retired Lieutenant General James W. Stansberry, former Electronic Systems Division commander, may be "the worst possible way to acquire defense equipment."⁴ Historically, a contractor's profit margin has been based on incurred costs. The higher the production cost, the

²Michael Schrage, "U.S. Dependence on Japan For Parts Worries Pentagon," Washington Post, April 5, 1986.

⁴Subrata N. Chakravarty, "The Carrot, Not the Club," *Electronic*, August 26, 1985, pp. 80-81.

growth since its inception. The program comprises 10 active contracts, including the following:

Westinghouse. The granddaddy of GET PRICE agreements, it features several ultramodern work-center processes already on-line at the company's new facility in College Station, Texas. Other new technologies demonstrated under GET PRICE will soon follow. These include the standard electronic assembly system, a new material accountability system, and robotic kitting. Employed in the production of printed circuit boards used in the radar systems of F-16 and E-3A warning and control system aircraft and in electronic countermeasure pods, these technologies are particularly well-suited to production rate fluctuations associated with defense electronics requirements.

General Electric. Although less than three years old, this contract is already yielding dividends. A new machining center at the company's military electronics operations plant in Syracuse, New York, is turning out high-quality components for use in the Air Force's Seek Igloo, North Warning, and Peace Shield long-range radar systems.

Singer-Kearfott. Jointly sponsored by the Air Force and Army, this arrangement calls for introduction of three technologies at the company's plant in Little Falls, New Jersey, which produces components for the Joint Tac-

tic Information Distribution System program for automatic placement of electronic subassembly parts. Finally, an incoming inspection process promises to ease the expense of checking the quality of vendor-supplied circuit elements.

Hazeltine. Like the Singer-Kearfott contract, this one provides for application of three modern manufacturing techniques that will principally benefit the Joint Tactical Information Distribution System program. This modernization effort at Greenlawn, New York, features the material storage transfer entry and routing system, a state-of-the-art assembly process for printed circuit boards; the quality test information system, designed to improve product quality and cut production costs; and a manufacturing and control system, which integrates factory work-in-process storage and distribution.

Rockwell-Collins. Two of the four projects outlined in this agreement will automate historically labor-intensive assembly operations. They are an integrated chip assembly system and robotic-assisted mechanical preparation. The two other projects are a subassembly burn-in assurance system and an integrated data and distribution system. Collectively, they are expected to generate savings of more than \$150 million in the class II terminal program for the Joint Tactical Information Distribution System at the Collins Government Avionics Division, Cedar Rapids, Iowa.

higher the price. As a result, contractors have been less than eager to refit their defense-oriented production lines. Simply put, companies have had a negative incentive to modernize, a disincentive aggravated by the constant specter of program cuts and cancellations. In this realm of cost-based pricing and acquisition budget vagaries, military electronics productivity has remained low and product costs have remained high.

The process leading to a formal GET PRICE accord begins with a memorandum of understanding between the two parties. This document sets forth broad guidelines within which the government and the manufacturer agree to explore the feasibility of an incentive arrangement. Next, Air Force technical personnel examine the physical plant and evaluate the candidate manufacturing technologies. If the latter are so new that they pose a high production-line risk, the government will require demonstration and, if necessary, modification to lower the risk.

Once the Air Force is satisfied with the prospect for suc-

cessful implementation, the parties strike up a formal business arrangement, which typically consists of several distinct phases. In the first one, the contractor submits specific proposals that delineate investment sums, projected savings, desired incentive amounts, and modernization completion target dates. Then, Electronic Systems Division officials, after evaluating the proposal's technical merit and expected rate of return, negotiate a bilateral agreement with the company. This pact sets forth the on-line dates for new tooling and incentive-payment procedures, schedules, and ceilings. Generally, the parties share savings up to an agreed-upon dollar amount that represents a rate of return comparable to what the contractor nets from commercial-production modernization investments. Finally, the government project officer negotiates product prices and estimates expected savings—the difference between before- and after-modernization production costs.

Although the contractor foots much of the bill for factory modernization, the government does chip in about one

dollar for every four the contractor invests. The government expects to realize an eight-to-one return on each dollar it puts in.

The GET PRICE program has grown considerably since August 1981, when the Air Force presented \$6.9 million in seed money to Westinghouse, a large-volume defense contractor that already had committed a substantial amount of its own capital to boost productivity and improve product quality. Presently, the Electronic Systems Division is party to 10 active GET PRICE contracts projected to yield savings in excess of \$1 billion (see figure). Six other agreements in various preliminary stages promise to add \$121 million to that amount.

Program officials acknowledge that it necessarily takes as long as five years for government GET PRICE investments to begin paying dividends, a reality incongruous with America's infatuation with quick results and fast payback. Thus far, the pioneer arrangements with Westinghouse and General Electric have both come of age and are in fact yielding the first wave of measurable savings. So far, factory modernization at Westinghouse's facility in College Station, Texas, has resulted in cost savings of \$12.7 million, of which the Air Force share was \$6.4 million. Signed less than three years ago, the agreement with General Electric is also bearing fruit. To date, modernization efforts at the company's refurbished military electronics operations plant in Syracuse, New York,

companies, Westinghouse and Rockwell, have already held in-plant technology transfer demonstrations.

Specifications streamlining

Complementing the Electronic Systems Division's efforts to enhance producibility and broaden the manufacturing base is a year-old program that is blazing a trail toward improved electronics reliability and maintainability. Readiness Improvement through Systems Engineering, or RISE, is a straightforward and simplified systems engineering approach that frees the contractor from the traditional morass of confounding, confining, and often unverifiable design specifications. However, it also holds the contractor's feet to a very hot fire with respect to the system's reliability and maintainability.

Instead of puzzling over the 57 reliability and maintainability standards that electronics requests for proposal once routinely contained, the contractor must meet criteria in only seven high-payback areas. The maintainability standards are mean time between critical failures, mean time between corrective maintenance actions, mean time to repair, and mean time to repair system (given administrative and logistical constraints). Reliability criteria are failures detected, failures isolated, and frequency of false alarms.

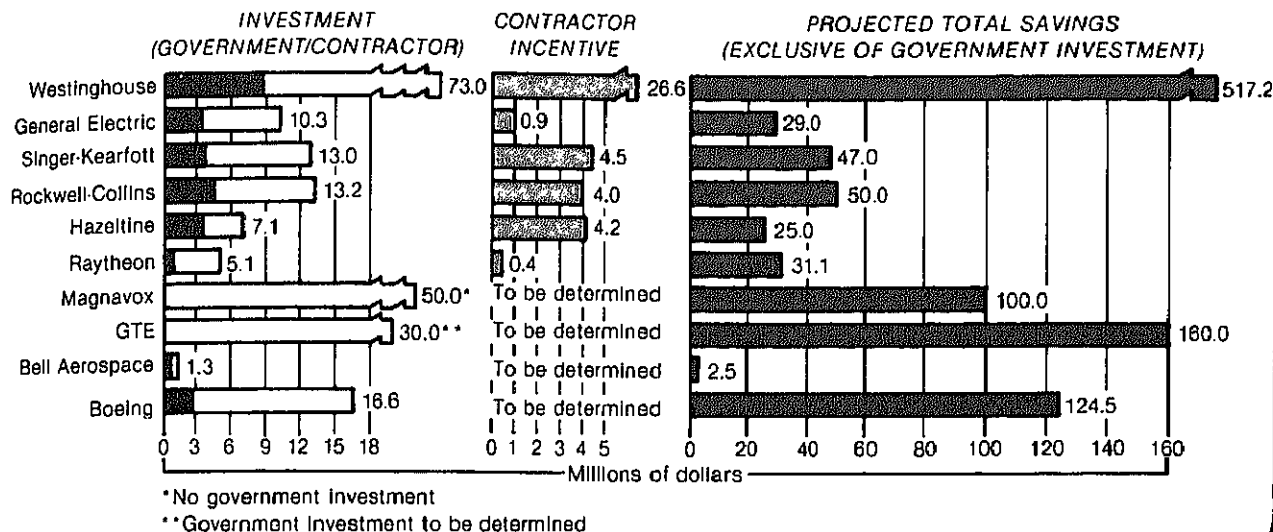
By virtue of development schedules that foster iterative

Simply put, companies have had a negative incentive to modernize, a disincentive aggravated by the constant specter of program cuts and cancellations. In this realm of cost-based pricing and acquisition budget vagaries, military electronics productivity has remained low and product costs have remained high.

have translated into a \$36,000 savings for each party. That amount represents only the first trickle of what promises to be a steady stream of savings.

Even GET PRICE, once the contractor has completed design and test, the Air Force subjects the standards a contractor achieves to stringent and rigorous verification. If demonstrated levels of reliability and maintainability are

GET PRICE arrangements to date



safety margins that far exceed baseline specifications. The radios for the B-1 and B-52 aircraft, for instance, have an operational life nearly double what it was before introduction of the new approach. Also, the original specifications for a miniature receiver terminal, a key element of the Minimum Essential Emergency Communications Network, called for a 1,000-hour mean time between critical failures. Under RISE, the contractor designed the system to exceed that standard fivefold.⁵

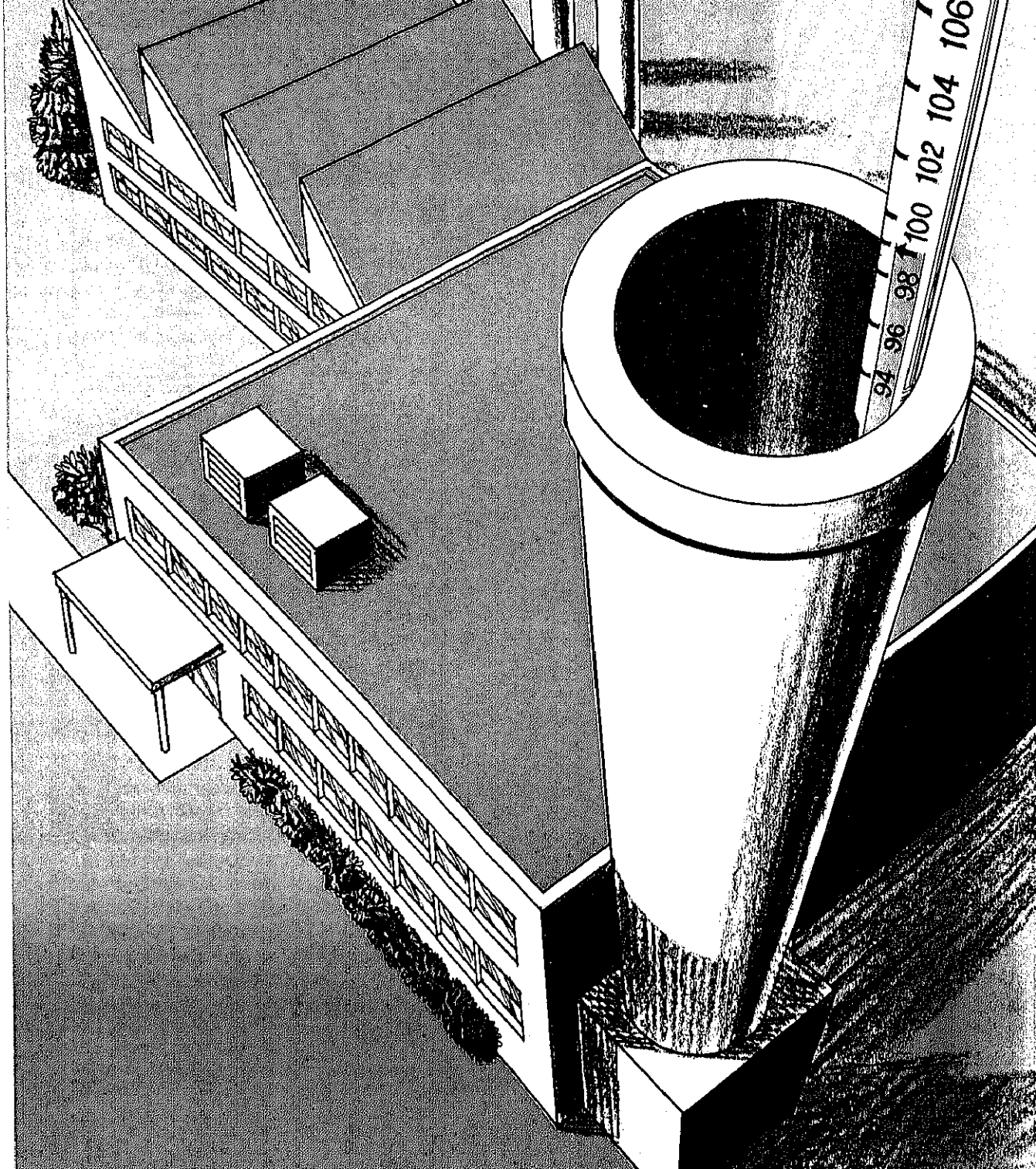
In addition to motivating prospective suppliers to build in reliability levels that exceed specifications, RISE binds contractors selected to warranties that, among other things, provide for repair or replacement of any defective component at no cost to the Air Force. These warranties are intentionally written in unsophisticated, comprehensible language that enables the user to enforce them quickly and easily. Moreover, the contractor is responsible for configuration control throughout the life of the warranty. Thus, if failure and return rates are higher than expected, the contractor is amply motivated to initiate and pay for product improvements.

Fundamental to the RISE program is an instruction booklet that the division's systems and design engineers follow when drafting requests for proposal. In the past, engineers had to consider some 45,000 complicated military standards and specifications for possible inclusion in solic-

itations. Now, they focus on 14 points outlined in the simple-to-use handbook.⁶ According to Lee Pollock, director of the Electronic Systems Division's readiness engineering office, this streamlined, back-to-the-basics approach enables engineers to prepare requests for proposal in weeks or even days. Under previous methods, solicitation preparation often took months.

Having tested the RISE concept on four representative development efforts nearly a year ago, the Electronic Systems Division is currently using the approach on 35 of its largest and most strategically important programs. Air Force officials are showing a keen interest in the new approach, and it may only be a matter of time until they implement it at the service's other product divisions.

A revolution is indeed under way and the Electronic Systems Division, with a healthy assist from domestic industry, is leading the charge on several fronts. Initiatives to enhance producibility, strengthen the manufacturing base, and tap the prowess of American business in order to acquire affordable and supportable electronics systems are shorting out incipient supply and reliability problems before they can do serious harm. These measures also call to mind the sentiments of the former head of the Air Force Systems Command, General Alton Slay, who observed, "To remain a first-rate military power, we must remain a first-rate industrial power." **DMJ**



An ailing defense industrial base: myth or misconception?

By PETER P. BELCH, IRENE KYRIAKOPOULOS,
ELLEN V. McCAULEY, and HERMAN O. STEKLER

Despite perceptions to the contrary, industries that make up the defense manufacturing base have performed no less creditably than those in the nondefense sector.

The condition of the U.S. defense industrial base has long been a subject of considerable interest, widespread debate, and some worry. In recent years, several government reports have suggested that America's defense industrial base may be in trouble. According to these reports, the ability of our defense industries to respond in time of crisis is eroding, a trend which, if left unchecked, could well prevent the United States from fulfilling its wartime military requirements.

At issue are recent declines in the performance and international competitiveness of those manufacturing areas that constitute the nation's defense industrial base. In its 1980 study, *The Ailing Defense Industrial Base: Unready for Crisis*, the House Armed Services Committee concluded that "the general condition of the defense industrial base has deteriorated and is in danger of further deterioration in the coming years."¹ Citing evidence of the adverse effects of foreign competition, the committee reported:

Another symptom of the decline in the vitality of the industrial base is the diminishing United States share of the total manufacturing exports of the world's industrialized nations The significance of this decline in the United States economy, relative to the remainder of the world, is difficult to assess; but this import penetration into certain industrial sectors

revitalization. With the passage of legislation authorizing the post-1980 military buildup, many observers assumed that forthcoming defense outlays would provide the needed catalyst. This assumption in turn reflected a belief that the economic forces driving defense industries differ from those that shape the nondefense industrial sector. But how valid is such a notion? Are defense industries really all that different from their nondefense counterparts? And has the plight of the defense industrial base been notably worse than that of the nondefense sector? Moreover, did the post-1980 boost in defense spending improve the performance and international competitiveness of the defense industrial base?

This article focuses on these questions. To help answer them, we use statistical measures such as growth rates of defense and nondefense industrial output, ratios of exports to sales, and ratios of imports to total supply. But first we need to distinguish between industries that are part of the defense industrial base and those that are not.

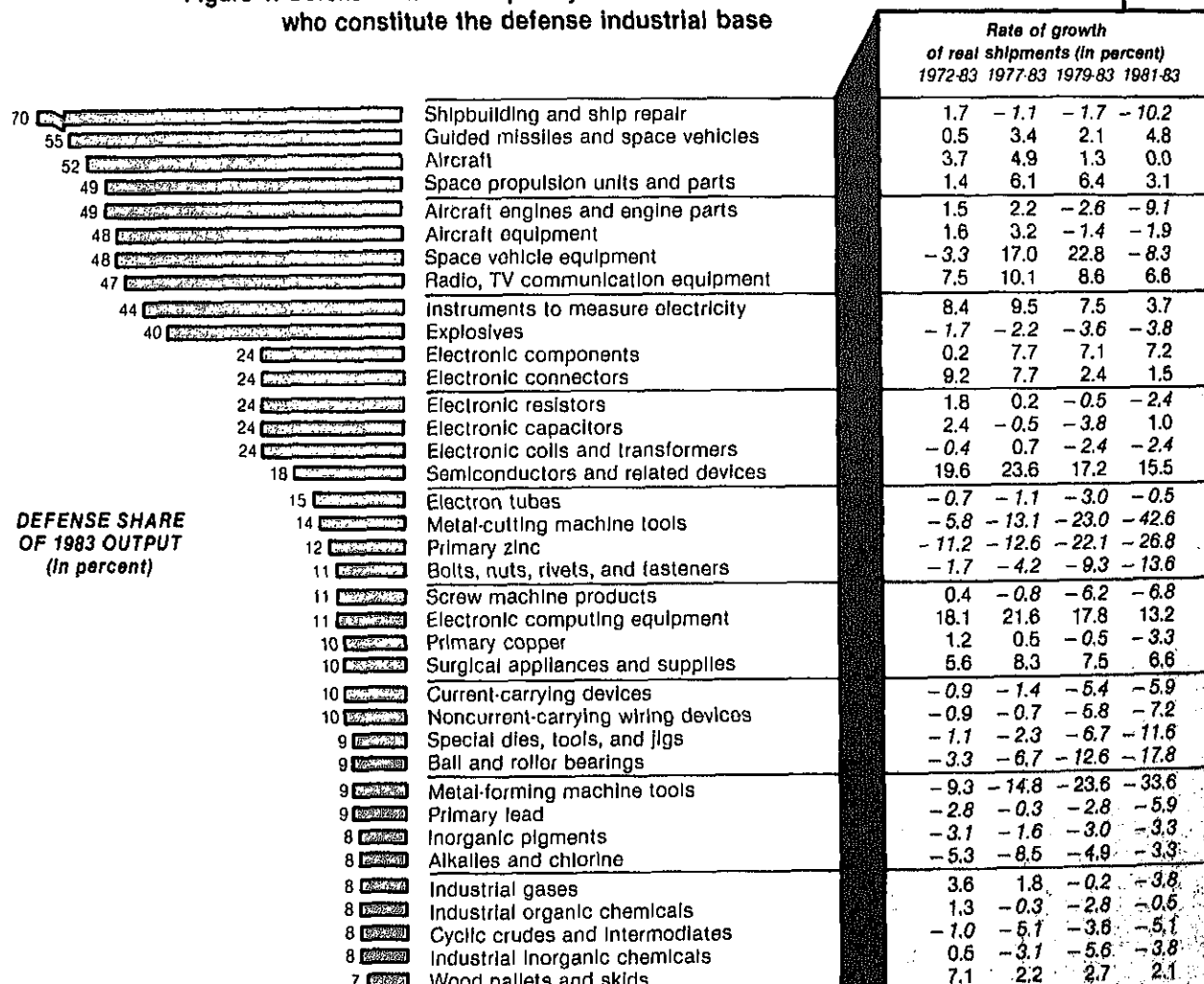
Most studies to date have begged the question of just which industries comprise the defense base. Likewise, analysts have never systematically identified those manufacturing outputs that are essential to defense operations. We

the Department of Defense, and have used it to identify the key components of the defense industrial base. Through direct purchase, the department buys an industry's end items; through indirect purchase, it buys the same industry's products used as components in other industries' end items. For example, both directly purchased electronics and electronics embodied in tanks, ships, and aircraft make up the total electronics output sold to DoD.

In 1984, goods and services purchased by DoD, directly and indirectly, represented about 7 percent of the gross national product. For purposes of analysis, we used this percentage as the criterion for including an industry in the defense industrial base. In other words, we created a

Data on the share of each industry's DoD-purchased output were available from the Defense Economic Impact Modeling System, jointly developed by the Defense Department and Data Resources Inc. to study the industrial impact of defense spending. Defense output in 1984 exceeded 7 percent in 76 of the 400 industries for which the model provides data. We derived figures on growth rates, ratios of exports to sales, and ratios of imports to total supply from *Industrial Outlook 1984*, published by the Department of Commerce. A cross-referencing of the two sets of data revealed that of the 207 product-oriented areas of American manufacturing, 37 met the 7-percent criterion

Figure 1. Defense-related output by American manufacturers who constitute the defense industrial base



and thus contained the defense industrial base that we studied.

Figure 1 shows the percentage of defense-related output for each of these 37 industries. Perhaps the most striking feature of this group is its diversity; the defense base truly spans the gamut of American manufacturing. Its components are not only important to defense, they are the backbone of the U.S. industrial complex as well. Prominent among them are several industries not traditionally perceived as defense-related, such as radio and television communication equipment, electronics, and machine tools. As the sample indicates, the defense manufacturing base includes most of the established smokestack industries as well as many enterprises operating on the frontiers of technology.

Having defined the defense industrial base, we next examined the hypothesis that industries composing that base have not performed as well as nondefense industries. To test this notion, we constructed specific measures of performance and international competitiveness and applied them at specific intervals within a 12-year span. We selected periods beginning in 1972, 1977, 1979, 1981, and 1983 for particular scrutiny primarily because of the availability of data for those years. Coincidentally, the five years chosen offered different combinations of economic conditions and defense postures. In 1972, the Vietnam War was still placing demands on the economy and on defense industries, but the first oil crisis had yet to occur. By 1977, the defense budget had shrunk dramatically and the economy was feeling the shock of sharply higher energy prices. Real increases in the defense budget began in 1979 and continued in 1981, despite a severe economic recession that year. The economy had recovered by 1983, another year of growth in the DoD budget.

To assess the two sectors' performance during the periods selected, we first compared the average growth rates of real shipments. Figure 1 presents these rates for the 37 constituents of the defense base. At first glance, it appears that performance, as gauged by growth in output, deteriorated, especially during the post-1980 recession. For example, from 1981 through 1983, output declined signifi-

cantly in shipbuilding and repair, metal-cutting machine tools, primary zinc, and ball and roller bearings. A quick scan of growth rates might lead one to believe that the performance of the defense industrial base actually worsened in the face of increasing defense expenditures. But how does this record compare to that of nondefense industries?

Summarized in Figure 2 are the two sectors' mean annual growth rates in real shipments for various periods from 1972 through 1983. Examination of these rates reveals that for the longer periods 1972-1983 and 1977-1983, average growth for the 37 defense industries was higher than that for the 170 industries not considered part of the defense base. The opposite was true for 1981-1983, the shortest period examined. However, none of these results are statistically significant at the 5-percent level of significance; thus the data do not substantiate the contention that defense industries grew at a rate different from that of other U.S. industries.

Next, we measured the competitiveness of the two groups using ratios of exports to production and ratios of imports to new supply. Examination of the absolute value of changes in these ratios during the various periods allowed us to determine whether there were structural differences between the two groups and whether the international competitive posture of the sectors had changed. Industries which increased their proportion of exports and reduced their proportion of imports were becoming more

Figure 2. Mean annual growth rates in real shipments by American manufacturers

INDUSTRY	GROWTH RATES (In percent)			
	1972-83	1977-83	1979-83	1981-83
Defense	1.424	1.354	-1.462	-4.530
Nondefense	0.774 (0.621)*	-0.451 (1.300)	-1.474 (0.007)	-1.239 (1.710)

*For each period, researchers performed a means test and arrived at the figures in parentheses.

SOURCE: U.S. DEPARTMENT OF COMMERCE

Figure 3. Exports as a percentage of production and Imports as a percentage of new supply

INDUSTRY	EXPORTS					IMPORTS				
	1972	1977	1979	1981	1983	1972	1977	1979	1981	1983
Defense	10.22	12.84	12.84	14.74	14.49	6.59	9.26	9.86	11.21	14.45

The last six years have seen great improvement in our nation's security posture. Most notably, perhaps, the tactical and strategic capabilities of the U.S. and its allies have come into closer balance with those of the Soviet Union and Warsaw Pact. But we must not overlook the need to improve the mobilization potential of the civil sector too. History tells us that a strong defense and a credible deterrence are largely predicated on adequate industrial output, effective transportation networks, abundant natural resources, and an efficient work force.

Recently, perceived shortfalls in America's defense industrial base have stirred public debate. Government officials have become aware of our growing dependency on foreign sources for end items, components, and raw materials. Additionally, they are concerned that the current emphasis on systems sophistication may inhibit the mass producibility required in wartime. Complicating matters is the continuing erosion of the subtler manufacturing base.

Enhancing industrial capability under such circumstances represents a major challenge, especially in the context of federal budget cuts. At the same time, the situation at hand offers an excellent opportunity for government agencies to cooperate in seeking solutions. As we take up that task, we should not underplay the positive aspects of our defense industrial base. American manufacturers are producing ultramodern, high-performance weapon systems and doing so by means of innovative manufacturing processes and technologies. What's more, the nation has a tremendous untapped economic capacity to meet emergency defense needs.

Of late, the federal government has launched a number of projects to capitalize

on our strengths and improve industrial responsiveness even further. Among the most promising are efforts to coordinate national resource preparedness planning. For the last three years, the Federal Emergency Management Agency has been spearheading development of a resources planning system intended to meet military and civilian mobilization requirements. Nine agencies are collaborating on this system, which, when fully developed, tested, and adopted, will enable interagency groups to conduct macro and micro analyses of potential shortfalls and bottlenecks; officials will then be able to devise and implement appropriate remedies. Of course, a clear statement of military requirements is necessary to drive the system, and we hope that the Joint Chiefs of Staff blueprint for action, the "Joint Industrial Mobilization Planning Process," will catalyze development of such a statement.

Production base analyses are another area of emphasis. Government and industry conduct these studies jointly, but industry plays the lead role in assessing production capacities, identifying constraints, and proffering solutions. These efforts focus on specific weapon systems and on the subtler of industries that supply prime contractors. Such vertical analysis is requisite to an understanding of production schedule relationships and the prospect of supply constraints on components, parts, and materials.

To date, production base analyses have uncovered several troublespots which are now receiving attention. Noteworthy among them are limited production space, the uncertain availability of semiconductors, and the pressing need for special tooling, castings, and forgings.

On a related front, defense and civil

specific issues that should be addressed. Complementing these efforts is the national assets protection program, a government initiative that enlists industry's voluntary assistance in formulating strategies to sustain public- and private-sector industrial capabilities vital to national security. Already in place are 97 pre-negotiated "machine tool trigger order" agreements, designed to facilitate industry's rapid expansion of machine tooling to meet surge requirements.

Despite inroads such as these, we still have a long way to go in nurturing an adequate industrial response capability. Several key tasks lie ahead. First, we must tailor our industrial preparedness concepts to our assumptions about major conventional military conflicts. We must also formalize plans that will ensure the expanded and accelerated production of critical warfighting items. In a similar vein, government must encourage industry to adopt modern, flexible manufacturing technologies that will facilitate smooth conversion of commercial production lines to meet emergency military needs.

Nor can efforts to improve readiness stop at the nation's borders. We need to better integrate our preparedness planning with that of our allies. Last April, the U.S. and Canada formally consented to cooperative civil emergency planning and management. The two countries are currently drafting a bilateral plan on defense industrial base preparedness, and we must pursue similar agreements with our other allies.

That the government cannot shoulder exclusive responsibility for national security emergency preparedness should be clear from the above remarks. The success of ongoing and future readiness initiatives hinges on the active participation and full commitment of American industry.

competitive while those moving in the opposite directions were becoming less so.

As is clear from Figure 3 on p. 35, defense industries exported a significantly larger proportion of their output during the years studied. For imports, though, the results were less definitive. From 1972 through 1983 (see Figure 3), the import share of new supply within the defense sector did increase relative to the import share of nondefense

industries. But the difference in the change in import ratios for the more recent time periods was not statistically significant, suggesting that most of the relative change in defense-related import penetration occurred early on.

The data in Figure 4, classified by the direction of change in both import and export ratios, provide a means to assess the international competitiveness of the two groups. The figures show that a greater proportion of de-

Figure 4. Mean changes in import and export ratios

INDUSTRY	EXPORT				IMPORT			
	1972-83	1977-83	1979-83	1981-83	1972-83	1977-83	1979-83	1981-83
Defense	.0333 [31] ¹	.0072 [31]	-.0028 [31]	-.0118 [31]	.0660 [25]	.0366 [26]	.0286 [27]	.0153 [27]
Nondefense	.0157 [122] (1.48) ³	.0030 [122] (0.37)	-.0073 [124] (0.38)	-.0150 [125] (0.30)	.0291 [111] (2.00) ²	.0217 [111] (1.04)	.0122 [114] (1.31)	.0054 [114] (0.87)

¹Figures in brackets indicate number of observations.

²Significant at the 5-percent level.

³For each period, researchers performed a means test and arrived at the figures in parentheses.

SOURCE: U.S. DEPARTMENT OF COMMERCE

defense industries increased their import ratios than did nondefense industries. However, the same held true for export ratios. Thus, it is not possible to conclude that defense-oriented industries have become any more, or any less, competitive than the nondefense sector.

The results of our analysis challenge the widely held view that U.S. defense industries are somehow different from other manufacturing industries. Actually, the growth record of the U.S. defense base essentially paralleled that of the rest of American manufacturing during the periods examined. In this respect, the defense industrial base does not appear to be or to have been "ailing" any more than the nondefense sector. And while they are more export-oriented than their nondefense counterparts, defense industries, like the rest of the American economy, have also become more internationalized in the last dozen years.

The validity of these findings hinges to some degree on the quality of data and the methods used to collect and organize them. Two possible shortcomings of our analysis were the matching of two different industrial classification codes and use of the 7-percent criterion for distinguishing defense from nondefense industries. A different matching might have produced different samples of industries, as might have the use of a higher defense output criterion, say, 9 percent. In both instances, we may have forced an arbitrary distribution of defense and nondefense industries; alternative classification schemes might have yielded other results. But those results would not have been different enough to affect our conclusion.

Someone might argue that the defense industrial base is smaller than we portray it, for example. If it is, the perceived "unacceptable dependency" on imports (see the House report cited above) was exaggerated and may have created an unwarranted push to assist defense industries. Conversely, one might argue that the defense industrial

and the decline of certain manufacturing sectors are evidence that the defense industrial base is ailing more now than in the past. From either perspective, measures designed to assist a select group of defense industries are a questionable expedient.

What the records do clearly show is the need for a comprehensive economic policy designed to strengthen U.S. manufacturing overall. Such a policy should take into account two important facts. First, the components of the defense industrial base are diverse and represent all major segments of American manufacturing. Second, the performance of these industries is not substantially different from that of the nondefense sector. Therefore, economic or industrial policies that aid American manufacturing in general will benefit the defense industrial base in particular. The best policy would be one which fosters an economic climate in which all manufacturers can thrive. **DM**

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Honing the cutting edge in defense depot maintenance

By JOSEPH E. ROBINSON

Ever vigilant in their efforts to conserve resources, DoD's depot maintenance managers are implementing a wide range of measures to promote efficiency.

The facts speak for themselves. Collectively, the Defense Department's maintenance program includes 33 major depots, employs about 160,000 personnel, consumes approximately \$14 billion in resources annually, and supports a weapon systems and equipment inventory valued at more than \$300 billion. The task confronting DoD maintenance managers is a sizable one.

It is also a critical one. Without adequate maintenance, weapon systems and equipment are not available for deployment, and readiness and sustainability suffer. DoD's organic maintenance capability, coupled with that of industry, assures the ability to surge in wartime: it is a cornerstone of our nation's mobilization base.

Recognizing that prudent stewardship of maintenance resources is vital to national security, defense officials have recently taken a number of actions to bolster the depot maintenance program. Areas affected include requirements determination, interservice support, electronic test equipment, inventory management, and asset capitalization.

Requirements determination. A defense depot maintenance budget which consumes a significantly large amount of resources demands careful scrutiny in order to maximize output and savings. Above all, the methodologies used in determining requirements must be valid.

Past experience has shown that the process of determining service requirements is a difficult one. To resolve this problem, the services and the DoD comptroller are working together to develop a uniform cost accounting system that will provide appropriate feedback for all users. Data collected under the system should facilitate accurate and timely adjustments to the budget as circumstances change rather than after the fact. For example, situations can develop—as they did in Grenada, El Salvador, and Libya—that require an unplanned expenditure of resources. In re-

ruption to the budgetary process.

Interservice support. To get maximum mileage out of depot maintenance resources, current DoD policy emphasizes aggressive use of interservice support whenever it is consistent with operational requirements and will save money. Under the depot maintenance interservicing concept, one service uses its organic facilities to maintain another service's equipment. During FY 1985, overall interservicing levels increased by approximately \$85 million over FY 1982.

Specifically, interservice support received by the Army increased from \$2.9 million in FY 1982 to more than \$8.7 million in FY 1985. The dollar value of support received by the Navy likewise rose, from \$61.2 million in FY 1982 to more than \$99 million in FY 1985. And, consistent with these trends, the Air Force saw its support from the other services grow from \$60.8 million to more than \$104 million during the same period. Though interservice support provided to the Marine Corps has not increased significantly, the levels of support have remained relatively constant. The Marine Corps received \$6.9 million of interservice support in FY 1982 and \$5.4 million in FY 1985. (For a service-by-service breakout, see the figure.)

The kinds of interservice support rendered are many and diverse. The Army, for example, services tactical satellite communications terminals for the Air Force, Navy, and Marine Corps at Tobyhanna Army Depot in Pennsylvania, while the Navy supports the Air Force AIM-7 Sparrow missile at the Naval Rework Facility in Alameda, California. At its Aerospace Guidance and Metrology Center in Newark, Ohio, the Air Force repairs inertial guidance platforms for both the Navy and the Army; the Marine Corps Logistics Base in Albany, Georgia, repairs a family of high-frequency radio sets for both the Navy and the Air Force.

Test equipment. DoD now owns 2.2 million items of elec-

agers review items on the list to determine whether existing or comparable equipment can satisfy so-called unique test equipment requirements. By reducing test equipment costs and improving overall support, these reviews will have a far-reaching impact on resources.

Related initiatives call for maximizing standardization of both manual and automatic test equipment and for use of commercial, off-the-shelf test equipment. Each of the services has implemented programs to reduce the proliferation of test equipment and to improve fault detection rates. The Army's test, measurement, and diagnostic equipment modernization program, for instance, derives directly from the standardization concept. Two of its objectives are:

- Introduction of up-to-date test, measurement, and diagnostic equipment into the Army inventory, while minimizing the number of different types and models.

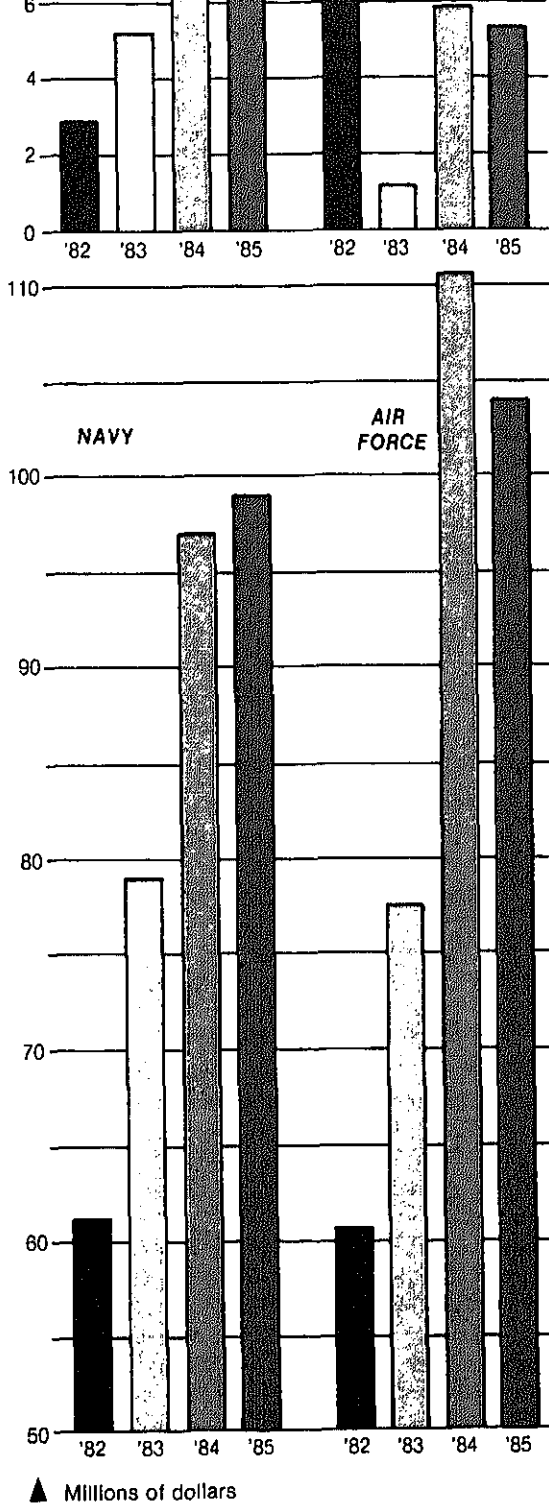
- Replacement of multiple generic types of such equipment with a single new item wherever possible.

Inventory management. Two major efforts to improve management of depot maintenance resources relate to inventory. The first, reliability-centered maintenance, is not a new concept. But its formal implementation into the services (through the efforts of the joint serial number tracking committee) has significantly influenced maintenance practices, particularly maintenance requirements affecting the Defense Department's approximately 24,000 aircraft.

Several years ago, normal practice would have been to schedule each aircraft into a depot after a specified number of flying hours or period of time for complete teardown and rebuild. By using the reliability-centered maintenance concept in conjunction with engineering analysis data, maintenance personnel have been able to gradually increase these intervals. Some aircraft, for example, now return to depots every 48 months instead of every 24 months. Among new aircraft in DoD's inventory, the F-16, F/A-18, and the Blackhawk helicopter have no fixed depot maintenance interval at all. Thanks to the proven success in applying the concept to aircraft, maintenance personnel are extending it to aircraft engines and even tank engines.

More widespread availability of data processing is also allowing managers to better schedule and control maintenance by means of serial number tracking, the second major effort affecting inventory. The Air Force C-5A aircraft unit at Dover Air Force Base, Delaware, has been a prototype developer of the process. Air Force technicians there track a variety of components by serial number down to the subcomponent level in order to troubleshoot malfunctions. In addition, the information gathered constitutes a maintenance history of the components tracked and creates a virtual road map for identifying all component locations. Using a comprehensive engine-monitoring system, the Air Force has also applied serial number tracking to the F100 engine in its F-15 and F-16 aircraft.

The Navy has adopted a similar approach for tracking parts on



lines, which need refueling every 12 years on average. Such extended times between shipyard visits require a sensitive and extremely comprehensive tracking of critical components. The service credits its particular form of serial number tracking with annual savings of more than a billion dollars.

The Navy has also concluded that it may be able to avoid as much as \$500 million in costs on its FY 1987 shipyard program by implementing productivity enhancements in material procurement and overtime. Results of a recently completed study of Navy organic shipyards indicate that the service can avoid those costs by adopting reliability-centered maintenance concepts such as extended maintenance intervals between ship overhauls and increased intermediate-level ship maintenance.

Asset capitalization. DoD maintenance facility and plant equipment resources offer additional opportunities for productivity improvements. The asset capitalization program for new depot maintenance equipment has expended more than \$2 billion over the past four years to procure replacements for aging plant equipment and to accommodate the repair technology revolution. The program provides a vehicle for initially using industrial funds rather than appropriated funds to purchase industrial fund equipment. Under its auspices, the industrial fund activity receiving the equipment initially finances the costs. The program recovers these costs over the life of the asset by charging a depreciation expense to the activity's cost of operations (and ultimately to the activity's customers).

The asset capitalization program has been a key factor in the modernization of the DoD industrial base, supporting development of new repair technologies such as robotics, better nondestructive inspection techniques, and lasers. These

ardous chemical wastes.

Within the office of the secretary of defense, the maintenance policy directorate has been in the process of developing a maintenance research, development, and application program which will synthesize initiatives such as these. As part of the effort, directorate staff will continue to explore additional areas which offer potential for improved maintenance, increased readiness, and reduced operating and support costs. Management of DoD depot maintenance resources represents only one area among many the directorate will investigate in order to identify additional actions that might improve resource management.

Specific areas to be investigated include:

- Measures the services use to determine improvements needed and the payoffs likely.
- Analyses and models the services employ to relate improvements in specific functions and processes to large-scale improvements in readiness or reductions in the support tail.
- Funding levels and types the services have applied or are planning to apply from FY 1980 through FY 1991 in order to improve the maintenance process.
- The feasibility of providing seed money to assist the services in funding programs with high potential. The intent is to use this money for both government and industry programs that apply technology to system support and to streamlined operation of the maintenance support infrastructure.

The impact of DoD's maintenance research, development, and application program will be far-reaching. It will offer the department an opportunity to take full advantage of a number of industry-inspired initiatives that should significantly improve our ability to manage depot maintenance resources. The results will

Past experience has shown that the process of determining the services' maintenance requirements is a difficult one. To resolve this problem, the services and the DoD comptroller are working together to develop a uniform cost accounting system that will provide appropriate feedback for all users.

technologies are helping to decrease repair times, increase throughput, and improve quality. For example, robotic deriveters remove aluminum rivets in just 30 seconds and steel rivets in 60 seconds, and they provide faster, more consistent removal of fasteners from aircraft with significantly fewer instances of damage to costly panels.

Along similar lines, the services are developing and implementing repair technology for turbine-engine blades and vanes previously considered irreparable. In the past, replacing turbine blades cost DoD approximately \$600 million annually; the new repair technology should save well over \$50 million each year. In

complement and enhance efforts already under way in areas such as interservice support, inventory management, and others discussed above. This panoply of management actions represents an ongoing commitment to conservation of maintenance resources in the interest of national defense. **DMJ**

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report synopsis

DoD's Industrial Modernization Incentives Program: an evolving program needing policy and management improvement

U.S. General Accounting Office, Washington, DC (GAO/INSIAD-85-131, September 6, 1985). Request copies of GAO reports from: U.S. General Accounting Office, Document Handling and Information Services Facility, P.O. Box 6015, Gaithersburg, MD 20877.

Under the Industrial Modernization Incentives Program, DoD offers current and prospective contractors monetary inducements to invest in efficient manufacturing equipment and processes. By doing so, the department seeks to reduce weapon system costs and build a stronger industrial base. The program helps counter contractors' historical unwillingness to invest in new tooling, a problem due in part to the instability of weapon system requirements and to DoD's practice of basing allowable profits on incurred manufacturing costs.

The Industrial Modernization Incentives Program bases payments on price reductions achieved and offers the contractor investment protection if the weapon system program is terminated. The Air Force introduced the approach in 1978, and the Army and Navy subsequently began experimenting with it as well. By early 1985, 94 contractors were participating in 50 industrial modernization incentive efforts.

In November 1984, a DoD steering group completed an evaluation of these efforts to determine whether the program is as cost effective as expected and to draft appropriate program policy and guidance. The General Accounting Office recently reviewed the steering group's findings and assessed the adequacy of the policy draft.

Incentives Program efforts will trim DoD procurement costs by \$6 billion over the next eight to 10 years. GAO analysts acknowledged that the program has excellent cost-cutting potential, but pointed out that DoD's cost-reduction estimates derive from early program projections and are subject to change. They called attention to other problems too.

For instance, the study team uncovered a lack of uniformity in the way DoD calculates and reports benefits. Officials present some benefits in terms of gross cost reductions, others in terms of net reductions. Some reflect a mixture of achieved savings and projected savings, and some are in then-year dollars, while others are in constant dollars. According to GAO, such a welter of reporting practices and formulas makes it very difficult for managers to meaningfully gauge the effectiveness of each modernization incentive effort.

The evaluators maintain that changes in the cost of weapon systems are the best measure of this effectiveness. However, neither the office of the secretary of defense nor the services have developed guidance on how and when weapon system program offices should incorporate projected benefits into their budgets and cost estimates. Air Force managers, not wanting to commit themselves to

The analysts recommended that the secretary of defense establish a cost-benefit reporting system that reflects discounted as well as then-year dollars, and they prescribed a methodology for incorporating benefit projections into program cost estimates and budgets. DoD concurred with the recommendation and already has revised its draft policy to improve visibility and ensure consistency of reporting. The department is also developing guidance on methods for identifying, tracking, and correlating benefits with future prices and program budgets.

GAO evaluators further recommended that DoD revise its proposed guidance to address the following questions:

- When and to what degree is direct funding in the government's best interest?

- What business arrangements between DoD and contractors best meet program objectives and minimize government costs?

- What are the best incentives for subcontractors and vendors?

The services now follow very different practices in funding the first two phases of a modernization incentive effort—the factory analysis phase and the engineering application technology review. Yet, the analysts noted, DoD has not adequately assessed the effects of these divergent funding approaches. The department's draft guidance states that DoD and service officials should encourage contractors to conduct modernization efforts in the absence of direct and indirect funding; it also prescribes direct funding only when that mode is clearly in the government's best interests. However, the guidance fails to outline or describe those conditions under which direct funding is advisable.

Civilian employee drug-abuse testing

By STEPHEN A. KLATSKY

Mr. Klatsky is the chief of personnel law and litigation, Office of Command Counsel, at the Army Materiel Command, Alexandria, Virginia.

It's not every day that a Defense Department document raises issues that are the ingredients of docudrama, among them, drug abuse, privacy rights, and legal wrangling over constitutional protections. But that is what DoD Directive 1010.9, "DoD Civilian Employees Drug Abuse Testing Program," has done.

Issued in April 1985, this five-page directive authorizes DoD components to establish urinalysis drug-detection programs to determine fitness for appointment to or retention in critical positions. To date, only the Army has implemented the directive, although the Navy and Air Force will soon follow suit. The three services' policies will differ somewhat; however, the Navy and Air Force draft proposals are comparable to the Army program outlined in the forthcoming revised Army Regulation 600-85, "Alcohol and Drug Abuse Prevention and Control Program."

Although it has begun urinalysis screening of certain prospective hires, the Army has yet to test on-board personnel on a widespread basis. A suit challenging the constitutionality of the urinalysis program is now before the U.S. Court of Appeals. Until the court renders a decision, however, the Army will proceed with testing.

Directive DoD 1010.9 defines positions subject to urinalysis testing as

those "sufficiently critical to the DoD mission or protection of public safety that screening to detect the presence of drugs is warranted as a job-related requirement." Such positions, it states, are in occupational fields related to law enforcement, property or personnel protection, internal security, and national security.

Presently covered under the Army program are special access positions that require certification of personnel reliability. Many of these positions are in the areas of nuclear and chemical surety. Also subject to screening are pilots, mechanics, air traffic controllers, and other personnel responsible for aviation and air safety. Army policy even extends to employees involved in the administration or execution of drug testing and to those whose official duties include treatment of and direct contact with enrollees of the alcohol and drug abuse prevention and control program.

The Army's drug-abuse detection effort focuses on three areas. It helps determine fitness for appointment to or retention in a critical position. It seeks to identify drug abusers and facilitate their enrollment in counseling, rehabilitation, and medical treatment programs. And it strengthens national and department-level security by identifying persons whose drug use could cause disruption of operations, loss or de-

struction of property, or potential blackmail leading to unauthorized closure of classified information.

Under DoD guidelines, the benefits of control positions must be written notification prior to the urinalysis. Army policy, for instance, requires that its components notify an employee at least 90 days before conducting the initial test. The notification must explain the rationale for testing, the consequences of failing or refusing the test, and the employee's right to submit medical documentation to disprove legitimate drug use. It also must inform the individual of counseling and treatment programs.

Once this initial grace period has elapsed, the activity may test personnel periodically, but not so randomly, irrespective of drug use. However, spot testing also may occur when officials have probable cause to suspect that an employee is under the influence of a controlled substance on duty. Moreover, agencies may conduct such tests in conjunction with government-sponsored accident investigations.

The Army program features a chain-of-custody process to protect the employee and the urine sample. It mandates, for example, the presence of an observer during the test to ensure that no substitution or tampering occurs. Any attempt to alter sample or test results invites disciplinary action in accordance with established policy.

If the field-conducted urinalysis reveals the presence of drug by-product, the sample is submitted to a certified laboratory for confirmation. An employee confirmed as positive, though having drug by-product in the sample, is eligible for locally sponsored counseling and treatment. But, regard-

job at the same grade and pay. If no such position is vacant, the agency can place the person in a lower-graded noncritical position, if one is available. Should neither option be available or prove workable, the employee is subject to termination for failing to meet a condition of employment. He or she may appeal any adverse action the agency takes.

In March 1986, the National Federation of Federal Employees filed a civil action in federal court challenging the constitutionality of the urinalysis drug-detection program. The outcome of this case, now before the U.S. Court of Appeals, will cast the fate of civilian employee urinalysis drug-detection programs throughout the government.

Specifically, the federation's suit challenges the Army's ongoing effort to test some 190 security guards at Aberdeen Proving Ground, Maryland. The union argues that the urinalysis program violates an individual's rights of privacy and due process as well as his or her Fourth Amendment protection from unreasonable search and sei-

zure. The Army, on the other hand, contends that the program is a departmental internal security measure which the law allows at agency discretion and excludes from the "probable cause" standard.

Regarding the unreasonable search and seizure issue in particular, the service asserts that its program identifies persons whose drug abuse could hamper or disrupt operations, and therefore serves national security interests which outweigh the individual's Fourth Amendment guarantees. National security is advanced, argues the Army, by a program which ensures that armed security guards at nuclear sites, chemical and biological laboratories, and munition storage facilities are free from the influence of illegal drugs.

Although no case law has arisen directly from the federal employee urinalysis testing program, various courts have permitted similar tests in the private and nonfederal public sectors. For example, the courts have upheld urinalysis testing of county school bus drivers, even absent evi-

dence of drug use. The bench also has sanctioned post-accident testing of train operators when drug use is not at issue.

Furthermore, the courts have found no overriding expectation of privacy in analogous situations. Police officers, for instance, have no subjective expectation of privacy with regard to body waste, and if they did, ruled the court, it would be offset by the public's entitlement to a drug-free police force.

The Army has designed its drug abuse prevention and control effort to ensure that civilian employees are free from the influence of illegal drugs and able to do their jobs competently and efficiently. The policy conforms to DoD's directed guidance and seeks to effect a delicate balance between the constitutional rights of the individual and the legitimate security and mission-performance interests of the Army. Now it is up to the bench to decide whether the department has struck a fair and constitutionally valid balance.

IMIP, from p. 41

and Navy officials believe that direct funding during the factory analysis phase is more appropriate for subcontractors and vendors than it is for primes. They based that conclusion on results of an Air Force review of 19 subcontractors and vendors who participated in one modernization effort. The findings suggested that direct funding leads to more timely and thorough factory analyses.

GAO also reported that the services are rapidly enlisting vendors and subcontractors into the Industrial Modernization Incentives Program. While DoD draft guidance advocates such efforts

applying incentive mechanisms at the subcontractor and vendor level. Moreover, the services' planning and programming structures have not kept pace with the growth of the modernization incentive program. Even though all DoD elements plan to expand modernization incentive efforts, only the Air Force has begun to develop a sufficiently structured planning and programming process to identify current and potential problems in the defense industrial base.

Compared to those of the Air Force, Army and Navy modernization incentive efforts are smaller and newer and primarily involve their largest contrac-

areas in which they can achieve the most substantial benefits.

While the services are individually responsible for industrial modernization planning and programming, the office of the secretary of defense must ensure that the program overall yields maximum benefits. Thus, GAO recommended that the secretary of defense evaluate the services' respective planning and programming efforts in order to ensure that those initiatives target areas which promise optimum results. DoD concurred and is taking steps to improve program planning by requiring the services to submit detailed status reports, by developing ap-

Flexitime on upswing in private sector

Acceptance of the flexible work schedule continues to grow throughout the American business scene.

According to results of a survey conducted by a Pennsylvania-based professional association, 29 percent of the 308 firms responding allow employees to flex their work schedules. A similar study in 1981 revealed that 22 percent did so; in 1977, the figure stood at 15 percent.

Among firms that allow flexitime, 98 percent permit employees to begin the workday at or before 0800 hours, and 95 percent require that workers start no later than 1100 hours. The most common core period—the hours when an employee must be at work—is 0900 to 1600 hours.

Nearly two-thirds of the companies surveyed still maintain the traditional five-day, 40-hour week. Second most common is the five-day, 37½-hour week. (*Administrative Management Society news release: May 1986*)

Ouster of Starrett nixed on appeal

A federal appeals court has overturned the Merit Systems Protection Board's 1985 firing of Charles O. Starrett Jr., who at the time was the head of the Defense Contract Audit Agency.

In the original case, the board ruled that Starrett's decision to reassign the since-retired George B. Spanton was made in retaliation to the latter's whistleblowing. (For more information, see Second Quarter 1986 *DMJ*, p. 41.) Spanton, as resident auditor in West Palm

gator that the agency was condoning a gross waste of funds by dragging its feet in looking into alleged contractor costing improprieties.

Reversing the board's decision, the appellate court found no evidence that Starrett "had improper motives or that Spanton's whistleblowing ... entered into his decision not to grant Spanton a waiver to DCAA policy." That policy calls for regularly scheduled rotation of auditors, though officials may waive a reassignment when extraordinary circumstances make it desirable to extend a resident auditor's tenure. In Spanton's case, the agency successfully maintained that such circumstances were not present, despite his contention that he was integral to the investigation of the contractor's alleged malfeasance. (*Federal Times: June 23, 1986*)

Shipyard work force responding to challenge

The Navy's competitive approach to ship repair contracting appears to have awakened a "sleeping giant," claims Competition Advocate General of the Navy, Rear Admiral Stuart F. Platt. He based the observation on early results of four commercial and four in-house shipyard contracts the service is closely monitoring.

So far, government personnel, galvanized by the competition and motivated by "their own self pride," are faring better than their commercial counterparts. The admiral believes that private firms are surprised by the federal work force's response to the challenge, which he likened to a fly-off contest used in aircraft selection.

The competition chief noted

of pressure from private firms wanting a share of the Navy's ship repair operations, which they perceived as bureaucratically snarled and inefficient. He added that "government workers are good workers" and that they are doing a quality job at low cost. (*Jane's Defence Weekly: June 21, 1986*)

Personnel development unit begins operation

The Air Force Systems Command has established a directorate of professional development, now in operation at Brooks AFB, Texas.

Headed by Dr. Louis Smith, the new activity will design, monitor, and evaluate education and training programs within the command, which has specialized personnel-development requirements not adequately met by the service's other schools and learning centers.

Officials selected Brooks AFB as the host site for several reasons: It is already the home of the command's systems acquisition school, and, in addition, it has an excellent audio-visual capability that instructors and course designers can tap to produce videotaped lessons for distribution to field units. (*USAF Aerospace Medical Division news release: April 25, 1986*)

Ruling shields defense firms from liability

Defense contractors won a major legal victory when a federal appeals court ruled that a manufacturer is not liable for death or injury resulting from defects in aircraft it has built for the military.

The 4th U.S. Court of Appeals overturned damages totaling \$4.7 million that a lower

haps. The families claimed that the aircraft—two helicopters and a reconnaissance plane—had design flaws which caused the crashes.

In reversing the lower court's ruling, the three-judge appellate panel cited the government's approval of design specifications and acceptance of delivery of the equipment as conditions sufficient to protect the contractors from suit.

Attorneys for both sides acknowledged that the Supreme Court will likely review the ruling, which is inconsistent with another appellate decision allowing defense contractors to be held liable in certain circumstances. (*Washington Post: May 29, 1986*)

AF setting record pace for competitive awards

The Air Force appears well on its way to achieving its highest-ever contract competition rate.

According to the Competition Advocate General of the Air Force, Brigadier General Gerald C. Schwankl, competitive contracts represented 88.8 percent of all procurement actions and accounted for half of the \$24.7 billion awarded in the first six months of fiscal year 1986. This amount equals the total dollars the service awarded competitively during all of FY 1984.

The general attributed the gains to the Air Force's procurement reform initiatives, including its spare parts improvement program and the appointment of 300 competition advocates throughout the service.

Barring a dramatic reversal in the final quarter of the year, the service should meet or exceed its FY 1986 competition goal of

calendar

Preparing the Defense Budget

Sep 4-5 Washington, DC
Nov 12-13 Washington, DC

Writing Statements of Work for A-76 Reviews

Oct 14-17 Washington, DC

CONTACT: (202) 632-5600

U.S. Office of Personnel Management, Training Nominations, WATDS, P.O. Box 7230, Washington, DC 20044

Management Skills Development: Part I

Sep 8-12 Washington, DC
Nov 3-7 Washington, DC

Management Skills Development: Part II

Sep 15-19 Washington, DC
Nov 17-21 Washington, DC

Management Development Program for Government Executives

Sep 21-26 (Phase I) Virginia Beach, VA
Nov 12-14 (Phase II) Washington, DC

CONTACT: (202) 447-3247

Center for Applied Management, USDA Graduate School, 600 Maryland Avenue, S.W., Room 108, Washington, DC 20034-2520

Space Electronics Conference '86

Sep 9-11 Albuquerque, NM

CONTACT: (202) 457-4942

Electronic Industries Association, GD Requirements Committee, 2001 Eye Street, N.W., Washington, DC 20006

Effective Skills for Technical Management

Sep 9-12 Washington, DC
Sep 23-26 Los Angeles, CA
Sep 30-Oct 3 Boston, MA

Ada Programming Workshop

Nov 18-21 Boston, MA

CONTACT: (213) 417-8888

Integrated Computer Systems, 5800 Hannum Avenue, P.O. Box 3614, Culver City, CA 90231-3614

Second AFCEA Asia-Pacific Conference and Exposition

Sep 9-12 Seoul, Korea

CONTACT: (703) 425-8525

Armed Forces Communications and Electronics Association

Ninth Annual Symposium on Survivability and Vulnerability

Oct 28-30 Silver Spring, MD

68th Defense Preparedness Annual Meeting

Oct 30-Nov 1 Colorado Springs, CO

CONTACT: (703) 522-1820

American Defense Preparedness Association, Rosslyn Center, Suite 900, 1700 N. Moore Street, Arlington, VA 22209

41st Annual Transportation and Logistics Forum

Sep 28-Oct 1 Tampa, FL

CONTACT: (703) 836-8303

National Defense Transportation Association, 727 N. Washington Street, Suite 200, Alexandria VA 22314-1976

MANPRINT Seminar

Oct 3-4 Dayton, OH

CONTACT: (202) 223-3703

Hay Systems, Inc., 2000 M Street, N.W., Suite 650, Washington, DC 20036

Conference on Software Quality Standards: Implementing DoD Standards 2167 and 2168

Oct 7-9 San Diego, CA

Eighth Industry/Interservice Training Systems Conference

Nov 18-20 Salt Lake City, UT

CONTACT: (202) 393-3620

National Security Industrial Association, 1015 15th Street, N.W., Suite 901, Washington, DC 20005

25th Annual U.S. Army Operations Research Symposium

Oct 8-9 Fort Lee, VA

CONTACT: (202) 295-1586 or AUTOVON 295-1586

U.S. Army Concepts Analysis Agency, CSCA-FO, 8120 Woodmont Avenue, Bethesda, MD 20814-1797

41st Annual Military Testing Association Conference

Nov 3-7 Mystic, CT

CONTACT: (203) 444-8333

Department of Economics and Management, U.S. Coast Guard Academy, New London, CT 06320-4195